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AGRICULTURAL RESEARCH INSTITUTE

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INTERNATIONAL INSTITUTE OF AGRICULTURE

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AGRICULTURAL INTELLIGENCE

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b) Communicate to parties interested, also as promptly as possible, the above information;

c) Indicate the wages paid for farm work;

d) Make known the new diseases of plants which may appear in any part of the world, showing the territories infected, the progress of the diseases, and, if possible, the remedies which are effective;

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f) Submit to the approval of the Governments, if there is occasion for it, measures for the protection of the common interests of farmers and for the improvement of their conditions, after having utilized all the necessary sources of information, such as the wishes expressed by international or other agricultural congresses, or by congresses of sciences applied to agriculture, or agricultural societies, academies, learned bodies, etc.

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Plants; *c*) a Bulletin of Economic and Social Intelligence; *d*) a Bulletin Bibliographique hebdomadaire (published every Saturday).

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The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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The Report that the Hungarian government has presented to the Chamber on the work done in 1910 contains much interesting information, embracing as it does every branch of agriculture. It is well known that the Hungarian Government exerts itself to the utmost, and at a considerable expense, to improve the agricultural condition of the country.

It maintains, as it has done for a long time past, numerous agricultural institutions for the improvement of the soil and crops, for the spread of agricultural knowledge, for the control and guarantee of the produce of the country; in brief for everything that tends to increase the prosperity of the rural population. As this form of activity is treated under the heading of *Agricultural Institutions*, here only the work done in the general interest will be reviewed.

1. *Agricultural labourers.* — In conformity with the Decree XVI of 1907, to the end of December 1910, 3600 houses for labourers had been built with State subventions, in 15 comitats, 83 communes and 3 chief towns.

Several thousands of these houses are in course of construction, and others are being planned; the State subventions consist in grants of 2 % amortisement of the borrowed capital and interest.

The insurance fund for labourers and agricultural servants has, during 1910, increased the number of its members by 1368.

At the end of 1910, there were 35 407 regular members insured in the various centres. The total number of members insured against accidents, death and for burial, etc., was at the end of 1910, 584 878. The fund has granted assistance in 16 958 cases, and to the amount of 583 894 crowns (£24 328.18*s*4*d*).

The capital of the fund was 7 300 000 kr. (£304 166). 41 200 kr. (£1675) were distributed as rewards to agricultural servants who had been a long time in the same situation; 15 of whom have been awarded medals for 40 years' service and one the silver cross for special merit.

In 1910, 16 300 copies of the *People's Journal* were distributed gratuitously to farm hands. 229 new people's libraries were founded, thus bringing their total to 3037. The amount granted to *people's houses* was 68 110 kr. (£2838).

2. *The Bureau of Agricultural Intelligence* has given 3309 informations free of charge.

In order to provide farm labourers with work during the winter, 549 courses of domestic industry have been held, and they were frequented in 1910 by 17 897 pupils. 85 associations for promoting domestic industry operated in 1910. The number of objects made was 737 067 and they fetched 489 347 kr. (£20 389.9*s*2*d*). 4423 popular lectures were held, in 80 comitats, at which 300 450 persons were present.

3. *Exploitation of State Domains.* — The lease for large estates has been fixed at 12 years, generally with the condition of building. For smaller estates the lease is only six years, but it is renewable if the farmer builds a permanent dwelling house and stables. In the leasing of pasture lands, communes are preferred to farmers.

4. *Regulation of estates.* — In pursuance of § XXXIX of the law which came into force on the 1st of May 1909, the operations for the regulation of estates (exchange of fields, rounding, and the cessation of contributions by forced labour) are making considerable progress. The permanent Committee of agricultural experts constituted according to the laws on the regulation of estates — as advisory committee — supervises the work from a technical point of view.

5. *Delegation for the Székely district (Transylvania) and for the mountain region.* — In the interest of the inhabitants of the mountainous parts of Transylvania, the Minister has granted considerable subventions and has constituted a Delegation for promoting all the branches of agriculture that are possible in those localities: Improvement of the soil, division of the land among the inhabitants, and everything tending to increase their welfare and their profit. Agricultural colonies, with free places, and attached to model farms, have been founded, as well as associations for the insurance of live stock. In order to further the diffusion of modern methods of farming the Minister has provided agricultural machines. The delegation has cared for the drainage of meadows, it has distributed improved seeds, and pedigree stallions, bulls and rams.

With a view to improving fruit-growing, the distribution of grafts and of good vine stocks, and grafting have been continued. The Ministry has encouraged beekeeping and poultry breeding.

The water courses have been restocked with fish, and wells have been excavated for the control of fires.

Domestic industries have not been neglected, and useful courses have been instituted for instruction in wicker work, fret work, sloyd, basket and mat making, weaving, knitting, toy making, embroidering, etc. With the help of various institutions the Ministry has organised the sale of the produce of these industries. Banks, insurance bureaus and mutual aid societies have been established. Lastly the Ministry has endeavoured to develop the intellectual life of these regions by assisting the formation of farmers' clubs, where subjects of common interest are discussed and lectures or courses of instruction are held.

6. *Promoting deep ploughing.* — The Ministry has lent the farmers of 11 comitats two Köszegi motor ploughs which have given excellent results.

About 400 arpents (568 acres) have already been worked with them.

7. *Supply of seeds.* — For the improvement of the crops, the best seeds from the state domains are sold to farmers at current prices.

8. *Production of malting barley.* — In order to develop the cultivation of barley for malt, the Ministry supplies « Hanna » barley at a discount of 25 %. For the study of the conditions obtaining abroad for the production of barley, which is an important item in Hungarian exports, the Ministry has sent to Bavaria the secretary of an agricultural association of a province in which barley is grown. The Ministry, with a view to extending their sale, has also

paid the carriage of the hops and barley sent to the exhibition of these commodities held at Berlin.

9. *Cultivation of potatoes.* — The favourable results which have attended the experiments hitherto made led to the establishment of new farms for the improvement of potatoes. Hitherto the only thing that had been done to develop this crop had been the extension of its area in the North of Hungary.

Now endeavours are being made to increase the yield and to find disease-resistant varieties.

In 1910 a considerable quantity of early potatoes was exported to France.

10. *Cultivation of hemp and flax.* — In order to promote these crops the Ministry has distributed seeds produced in the state domains, partly of local varieties, partly of Italian, besides which 1000 quintals (1968 cwt) of original Russian linseed have been sold to small farmers at advantageous prices.

The professor charged with the cultivation of hemp and flax has been always at the disposal of farmers to give information on the cultivation of fibre plants, the retting of hemps and the erection of works for the manipulation of flax.

11. *Hops.* — Endeavours have especially been made to produce superior qualities, with the object of attaining higher prices and overcoming the stagnation of the hop market of the last few years.

The state farm at Hòdság for the improvement of the hop plant deserves especial mention.

12. *Medicinal plants.* — At the Koloszvar model farm for the cultivation of medicinal plants, several experiments in this connexion have been made, and the course on these plants has been repeated owing to the interest it had aroused.

13. *Agricultural distilleries.* — 173 petitions for the concession of such distilleries were presented in the course of 1910. The stock of alcohol in 1910 was 15 000 hectolitres (330 000 gals).

14. *Popular Model Farms.* — In 1910, 9 new model farms were established.

15. *Distribution of seeds.* — In order to assist small farmers whose fields had been damaged by field mice or by the weather, the Ministry sold them farm seeds with a discount of 15 to 30 % as a State subvention.

16. *Destruction of injurious animals and plants.* — The Ministry has ordered the Entomological Station to carry out experiments, especially for the destruction of field mice.

17. *Agricultural associations, federations and farmers' clubs.* —

The present number of agricultural associations, federations and farmers' clubs is 1300. These institutions have availed themselves largely of the credits placed at their disposal and much assistance has been give to the local shows organised by them.

18. *Control of adulterations of agricultural produce.* — To increase the control of adulterations the Ministry established in 1910 two stations for chemical analysis at Szabadka and Tjvidék, which bring up the total of chemical stations to 13; there are besides 2 for the examination of alcohol and 3 for the control of seeds, or altogether 18 stations for the control of adulterations.

The measures for the control of alcohol ferments and beer yeast have been rendered more stringent.

MARVAUD, ANGEL. **Agricultural Improvement of the Portuguese Colonies.** (La mise en valeur des Colonies Portugaises). — *La Revue Economique Internationale,* Vol. I. No. 1, pp. 86-124. Bruxelles, 15-20 Janvier 1912. 765

Portugu Coloni

The Portuguese colonies are the following:

Africa: The Cape Verde Islands, Portuguese Guinea, the Islands of S. Thomé and Principe, Angola and Mozambique.

Asia: Goa, Diu, Damao and Macao.

Malay Archipelago: A part of the island of Timor.

The Portuguese colonies are about 800 000 sq. miles in extent and have a total population of 9 208 000 inhabitants.

The economic development of the *Cape Verde Islands* has not been such as might have been expected from their climate and splendid maritime position; these advantages have not counterbalanced the aridity of the soil caused by the lack of trees and of a regular rainfall.

The first improvements to be taken in hand should be irrigation works and afforestation. The crops most extensively cultivated are those that supply the bulk of the food of the native population: sorghum, beans, potatoes, pumpkins, manioc. The chief staples of exportation are: physic-nuts, called also Barbado-nuts (1) (purgueira), coffee, skins and hides, alcohol, palm-oil and salt.

Portuguese Guinea has a fertile soil, suitable to a great variety of crops, and is besides endowed by nature with an important network of water-ways, which render the building of costly railways unnecessary, but the economical and financial situation of the province is not good. Among the crops which might yield large returns, the following are the chief: sugar-cane, especially on the low coast land, rubber, both on the islands and on the main land, carapa (1) or bead tree, cotton, kola, tobacco, etc.

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(1) A small shrub, belonging to the Euphorbiaceae; see *B.* April 1911, No. 1091. (*Ed.*).

To this list must be added an immense extent of rich forest, hitherto completely neglected. At present the principal exports are: rubber, ground-nuts or *mancarra*, palm-nuts, physic-nuts, bees-wax and hides.

The *Islands of S. Thomé and Principe* are the best Portuguese colonies. Of the various cultivated plants that have been introduced: coffee, cacao, cinnamon, cloves, chinchona, vanilla, kola, rubber, etc., most of them have succeeded so well that these islands may be considered as an experiment garden for all tropical crops. — The most important export is cacao, which amounts to about 95 % of the total export. Next comes coffee and then chinchona and palm-nuts.

Kola, sugar-cane and vanilla give but an insignificant contribution to the export trade. The same may be said of rubber, which however, appears to hold out a good promise for the future.

The economic revival of this colony is partly due to the fact that cacao has found a vast market, and partly to the great success that has attended the formation of powerful colonisation companies. The economic development of these islands has however to struggle against two great difficulties: lack of labour and insufficient means of communication.

Angola is provided with an important network of rivers, which facilitate commerce with the interior and favour the development of agriculture. Its fertile soil is suitable to a great variety of crops and the best results are to be expected from the improvement of vast districts of the colony which are still uncultivated, and in fact only imperfectly explored. The principal exports consist of rubber, coffee, and bees-wax.

The decrease in the export of rubber is due to the fall in prices of this commodity on the Lisbon market.

The crisis has been rendered more severe by the difficulties of transport. Coffee, cotton, and alcohol are still suffering from the crisis. The Portuguese Government has repeatedly issued some very stringent regulations on the cultivation of sugar-canes for the distillation of spirits, and has put almost prohibitory duties on imported foreign wines and spirits. At the same time attempts have been made to promote the manufacture of sugar instead of alcohol and to develop the cultivation of cotton. Unfortunately Angola has to contend with the want of labour, of capital and of the means of transport.

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(1) *Carapa guianensis* (Meliaceæ) a large tree from whose seeds, enclosed in capsules, carapa-oil is extracted. (*Ed.*)

The railways of Angola will consist of the four following trunk lines, parts of which are already opened to traffic; others are being built or still in the preliminary stages.

1. — The Loanda-Ambaca line, already built and intended for the development of this region which is so rich in coffee.

2. — The Benguella line calculated to develop the Gand and Baïxa Hanha districts, well adapted to the cultivation of tropical plants, and especially of the sugar-cane.

3. — The line from Mossamedes to the plateaus of Chella, in course of construction.

4. — The projected line from Bahia los Tigres or from Porto-Alexandre to the eastern or southern frontier of Angola.

Mozambique possesses all the requisites for a rapid economic and agricultural development, such as fertile soils favourable to the growth of all kinds of exotic plants, and virgin forests, together with a climate equally suitable to Europeans and to Asiatics, and a numerous population.

Its principal staples of export are seeds and other oil crops, rubber, cane-sugar, cotton, coffee, yellow wax, timber, ivory. The Mozambique Company exploits a territory of 60 000 sq. km. (21 000 sq. miles) in extent. It grows rice, cotton, coffee, rubber and sugar and it has given considerable development to the fibre and salt industries. This Company follows a methodical plan of improvement.

The Nyassa Company controls 250 000 sq. km. (96 375 sq. miles) of country, and the Zambesi Company 155 000 sq. km. (59 750 sq. m.). This latter has especially devoted itself to the agricultural exploitation of the Lower Zambesi.

Portuguese India (Goa, Diu and Damao) is obliged every year to import millions of francs' worth of rice, which forms the chief food of its population and which the colony does not produce in sufficient quantity, owing to defective agriculture and insufficient irrigation.

Macao has no agricultural importance. The colony defrays its expenses with the income derived from lotteries and the opium tax

Timor is one of the richest of the Portuguese colonies in natrural wealth; its soil is suitable for all such crops as coffee, cacao, tea, rice and maize. Cotton and tobacco grow almost spontaneously; sandal wood is abundant in its rich forests. The climate is not good, but labour is plentiful.

With better management and more independence, and a less prohibitory system of taxation, the Portuguese Colonies might become a source of prosperity for the mother country. Greater care should be bestowed on agricultural education so as to suit it better to the wants of the various colonies, and in all the Portuguese colonies in Africa and in Timor the organisation of rural credit is an urgent need.

The following figures give the values of the exports from the several colonies:

Cape Verde	£	70 726
Portuguese Guinea	»	113 613
Angola	»	1 001 477
San Thomè and Principe	»	1 547 369
Mozambique	»	4 202 515
Portuguese India	»	156 191
Macao	»	1 546 519
Timor	»	71 328

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

Formation of a Foreigners' Section at the Institut National Agronomique in Paris. (Création d'une section étrangère à l'Institut National Agronomique). — *Journal Officiel de la République Française.* Paris, 13 Avril 1912.

By a ministerial decree of December 2nd, 1911, a foreigners' section has been formed at the Institut National Agronomique in Paris. Foreign students must go through a competitive examination to be held every year at the same time as that for the admission of French students. The subjects will be exactly the same as for French students, with the exception of French composition.

The foreign candidates will be classed together and apart from the French ones. For admission they must get at least as many marks as the lowest French candidate admitted.

The number of foreign students admitted must not exceed ten each year.

Agricultural High Schools in South Australia. — *Journal of the Department of Agriculture of South Australia*. Adelaide, February 1912. 767

The Government of South Australia has decided to establish two agricultural high schools under the Education Department, one at North Bundaleer and the other on the Moorak homestead.

It is intended that the new schools shall serve the purpose of preparatory schools for students desirous of entering Roseworthy College, that they shall be utilised for the training of the teachers of the primary schools, especially those located in country districts, in agricultural subjects, and that winter classes for farmers shall be formed in connection with them.

South Australia

Students from the primary schools will be enabled to advance to the proposed high schools, thence to Roseworthy College, and finally to take their B. Sc. degree at the University. Minister Wilson expressed also the hope to see Roseworthy College become the Agricultural University of the State with free instruction at the agricultural high schools.

KECSKEMÉTHY GÉZA. **The National Vine-growing Colony "Miklós" for the Improvement of Sandy Soils, and the School of Vine Cultivators at Kecskemét, Hungary.** — *Borászat Lapok*, No. 12. Budapest, 17 March 1912. 768

The last school inaugurated at Kecskemét, in the "Miklós" national vine-growing colony, is one for giving instruction in the cultivation of the vine on sandy soils, of which the first example, attended by good results, was given in 1883 by M. Jules de Miklós, general Commissionner for vine-growing in Hungary. The Miklós national vine-growing colony is 200 arpents (284.4 acres) in extent The school course extends over 11 months, and is attended by 40 pupils, who learn to transform sterile sandy hillocks into profitable vineyards.

Hungary

The pupils are recruited mostly among the young men who have finished their military service and who are able to read and write, and they become intelligent, reliable vine growers, and foremen in vineyards. Besides their board, the pupils get 10 crowns (8*s* 4*d*) per month, for which they engage to do all the work from early morning to evening, during the whole course.

Theoretical instruction is given only on holidays, on Sunday afternoons and in the winter evenings. It embraces the following subjects: injurious animals, plant-diseases, soils and manures, hor-

	Members.
14. Bernese Federation of Cheesemakers' Societies	2 000
15. Federation of the Dairy and Cheesemakers' Societies of N.-E. Switzerland	8 100
16. Federation of the Dairy Societies of N.-W. Switzerland	4 400
17. St. Gall Federation of Cheesemakers' Societies	1 000
18. Aargau Federation of Dairy and Cheesemakers' Societies	2 340
19. Thurgau Federation of Cheesemakers' Societies	2 000
20. Vaud and Fribourg Dairy Federation	4 424
21. Peasants' and Labourers' League of Bâle-Campagne	1 000
22. Aargau Peasants' Federation	1 000
23. Federation of Swiss Foresters	650
24. Vaud Horticulturists' Association	75

The Union has been occupied with matters of general agricultural interest, such as the prohibition of artificial wines, epizootic diseases, insurance, regulations for the administration of the Swiss army, customs duties on frozen meat, elections to the National Council, shows.

The market review has continued to be printed in a number of newspapers, but only in two in French Switzerland, which already has much-appreciated market reviews.

The report also includes an account of the foundation of the Swiss Cheese-Exportation Society, to which the Union contributed largely, and which has been of great benefit to the Swiss cheesemaking industry.

The *Paysan suisse* (Swiss Peasant), the organ of the Union, has developed considerably; the average circulation is 77 730 copies of the German edition and 19 830 of the French.

The accounts show that voluntary subscriptions contribute very largely to the work of the Union, having reached nearly 35 000 frs. (£1400) in 1911.

771 **Agricultural Institutions in Hungary. Recent Work.** *A. M. Kir Kormány 1910 évi mükodéséröl és az orszag közállapotairól szóló jelentés.* (Extract from Report of Hungarian Government on Work done in 1910).

Hungary

1. *Central Committee of Experiment Stations.* — This committee has included in its new constitution: the agricultural, vine-grow-

ing and forest experiment stations, as well as the associations connected with the stations, and consulted by the Ministry of Agriculture. The committee held in 1910 two general meetings and gave expert opinion on 40 important questions. Its official organ is the *Kisérletügyi Közlemények,* in which 37 expert reports have appeared.

2. *Royal National Biological and Animal-Feeding Station.* — The experiments carried out at this station have dealt with : 1 Comparative value of maize, barley and starch for fattening purposes. 2. The food requirements of the " mangalicza " breed of pigs. 3. Chemical composition of wheat bran and of forage maize. 4. Respiratory apparatus. 5. Dry and moist foods for cows (turnips, fresh and fermented leaves). 6. Respiration of pigs. 7. Chemical composition of dry yeast and its food value.

3. *Dairy Experiment Station.* — It has examined a number of samples of milk as to their fat content, with a view to selecting, for breeding purposes, the best milch-cows. It has besides experimented upon the bactericidal properties of the disinfectant called " pyricite " and upon the value of the milk so treated as a food for infants. It has further instituted researches upon mastitis due to streptococci, and on the utilisation of the catalase and reductase milk tests. It has given expert opinion in 63 cases.

4. *Royal National Wool-Grading Establishment.* — This establishment has continued its investigations on the improvement of the fleece of " karakul " sheep used as fur. It has continued its determinations on the production of the best sheep for wool (merinos, etc.). To judge the wool of the animals intended for reproduction, thirteen classes based on microscopical examination have been made. The fineness of wools (under the miscroscope) has been determined, as well as their resistance and elasticity.

5. *Royal National Bacteriological Institute.* — In 1910 the Institute examined 1709 cases, in 548 of which it distributed 3 126 doses of mallein ; and in 37,2875 grams of concentrated tuberculin. For the destruction of field mice, it distributed a quantity of Löffler's typhoid bacillus culture, sufficient for 43 444 ha (107 300 acres), and for the destruction of rats the same culture in 70 cases. In 1910 a section for the preparation of lymphs for vaccination was added to the Institute, and between the 1st of November and the 31st of December of the same year, it distributed 10 670 doses.

6. *Royal National Agricultural Experiment Station at Magyaróvár.* — At this station a number of experiments were made on the cultivation and manuring of various plants, partly in its own experiment fields at Magyaróvár, and partly in schools of agriculture or

in private properties. Experiments for promoting the cultivation of sugar beets have been continued.

7. *Royal National Institute for the improvement of plants* at Magyaróvár. — This Institute began working in 1910; its object is to improve the cultivation of various plants, and the production of seeds, especially of wheat.

8. *Royal National Seed-Testing Stations.* — The Budapest Station has made experiments on the cleansing of seeds and has tested the international methods of seed control (purity and germination). The other stations are at Kassa, Keszthely and Kolozsvár.

9. *Royal National Tobacco Experiment Station at Debreczen.* — This station has carried out numerous experiments with the object of extending the cultivation of tobacco, of improving the soil and the manuring for this plant; other tests dealt with the successive working of the leaf (fermentation, etc.). The Florida method of growing tobacco in the shade has been submitted to further trials.

10. *Royal National Chemical Institute and Chemical Experiment Stations.* — These Institutes are entrusted with the chemical examination of all agricultural produce, for the control of fraud. The Chemical Institute has specially investigated the qualities of Hungarian wheats and flours. The Station of Fiume has examined the food value of the fish sold in the Bay of Quarnero. The Magyaróvár station has tested the preservation of molasses feeds and instituted researches on the digestibility of dry turnip slices, and of dry distilled maize pomace.

11. *Royal National Alcohol Experimnt Stations.* — The station of Kassa held two courses on distillation. The two stations of Budapest and of Kassa have the duty of controlling alcoholic ferments.

12. *Royal National Agricultural Machinery Experiment Station* at Magyaróvár. — It has tried many machines and implements, and has given 23 expert opinions and judged 67 cases.

13. *Royal Hungarian Agricultural Museum at Budapest.* — It continues to interest the public, both foreign and native. Besides the old sections it is provided now with a library and with a lecture hall.

14. *Royal National Fish-breeding and Sewage-water Purification Stations.* — These stations have carried out theoretical and practical experiments on the breeding of fish and of cray-fish. They deal with the improvement of fish-ponds and their statistics, with the pollution of streams and with the purification of industrial and town sewage waters. They have besides conducted important physiological research, such as: the determination of osmotic pressure

and the alterations which take place in the blood of fish under the action of various poisons, with a view to discovering a scientific physiological method for the investigations on the poisoning of fish. These researches are being continued.

15. *Royal National Institute for Meteorology and Terrestrial Magnetism.* — In 1910 the meteorological stations of the first, second, and third order dependent on this Institute were 212, besides the vine-growing and forest stations. Besides the observatory at Ogyalla, provided with all the apparatus for meteorological, terrestrial magnetism and seismographical observations, the Temesvár and Nagytagyos Stations may be considered as observatories. Those of Szeged, Koloszvár and Ungvar possess seismographs and in many localities various self-registering apparatus are to be found.

16. *Royal Hungarian Geological Institute at Budapest.* — 16 geologists, besides 10 outside collaborators, are engaged on geological and agrogeological surveys. Recently, after several years' work, a survey of peat moors has been terminated; other geological maps are in course of preparation.

17. *Library and publications of the Ministry of Agriculture.* — In 1910 a catalogue of the library, which possessed then 16 806 volumes, was made. In 1911, 861 new volumes were bought. The publications of the Ministry were 78 in number, and 105 114 copies were distributed gratis to farmers. The expert reports of the Ministry are published in the *Földmivelési Ertesitö*, now in its twenty-third year, which has also published several important decrees of general interest.

The other agricultural institutions depending on the Hungarian Ministry of Agriculture are:

18. *The Roy. Hungarian Agricultural Academies* at Magyaróvár, Debreczen, Kassa, Keszthely and Kolosvár.

19. *The Roy. Hungarian Schools of Agriculture* at Ada, Algyógy, Breznóbánya, Békéscsaba, Csákova, Jászberény, Hodmezövásárhely, Karczag, Kecskemét, Komárom, Lugos, Nagyszentmiklós, Pápa, Rimaszombat, Szentimre, Szabadka, Szilágysomlyó, Csikszereda, and Kisszeben.

20. *The "Small Szabó Jozsef School" of Agriculture* at Torda.

21. *The upper course of vine-growing and wine-making* at Budapest.

22. *The preparatory school for cellar foremen* at Bodafok.

23. *The Roy. Hungarian vine-growers' schools* at Bihar-Diószeg, Eger, Magyenyed and Pozsony, Kecsksmét, Ménes, Tapolcza, Tarczal and Pécs.

24. *The Roy. Hungarian gardeners' school* at Budapest.

25. *The course for assistant gardeners* at Budapest, and at Baja.

26. *The Roy. Hungarian course for gardeners' labourers* at Lőcse, Torda and Nagybocskó.

27. *Course of horticulture* at Orosháza.

28. *Royal Hungarian higher school of mines and forestry* at Selmeczbánya.

29. *The Roy. Hungarian schools for forest guards* at Királyhalma, Vádászerdö, Liptóujvár and Gorgényszentimre.

30. *The Central Forestry Experiment Station* at Selmeczbánya.

31. *The Roy. Hungarian agricultural professors, for the production of hemp and of flax.*

32. *The travelling professors for the cultivation of hops.*

33. *The professors for the cultivation and organisation of pastures.*

34. *Professors for the production of potatoes.*

35. *Small model farms.*

36. *Roy. Hungarian inspectors for stockbreeding, dairying, and silkworm-breeding.*

37. *The Roy. Hung. school of water overseers.*

38. *The public hygiene section of the Roy. Hung. Direction of hydraulic works* at Budapest.

39. *The Roy. Hung. entomological station* at Budapest.

40. *The four great State studs* at Mezóhegyes, Kisbér, Bábolna and Fogaras with their model farms.

41. *The State bee-keeping establishment* at Gödöllö.

42. *The council of veterinary hygiene* at Budapest.

43. *The State vineyards* for the production of the various American and European stocks and scions.

44. *The central model wine cellar* at Budapest.

45. *The wine control committees* in the sub-prefectures.

46. *Sulphide of carbon depots.*

47. *The Roy. Hung. fruit growing experiment station* at Tyey.

48. *The stations for the protection of fruit* at Nagybánya.

AGRICULTURAL SHOWS AND CONGRESSES.

772 RICHARDSON, A. E. V. **Nhill Farm Competitions in Victoria.**—*The Journal of the Dept. of Agr. of Victoria.* Melbourne, January 1912

Australia: Victoria

In connection with the Nhill Farm Competitions of the year 1911 entries were received in the following sections:

Large Farms, Small Farms, Crops, Fallow.

We shall give here the scale of points used in judging the farms.

1. Best system of cropping, rotation, cultivation	35
2. Character, condition, and value of farm crops	20
3. Condition of the fallow, taking area into consideration	20
4. Live stock	
Horses	25
Sheep	20
Cattle	10
Pigs	5
Poultry	5
5. Boundary and subdivision fences and gates	20
6. The most complete and efficient system of water storage	45
7. Arrangement, character, and condition of farm buildings	20
8. Best kept and most suitable orchard and vegetable garden	10
9. Best provision of reserve fodder	20
10. Best efforts in direction of tree planting	5
11. Farm and live stock insurance	5

For the crops the following points were used:

Freedom from Weeds	15
Evenness and Regularity	15
Freedom from Disease	15
Trueness to Type	20
Apparent Yield	35
Total	100

In judging the fallow, the following points have been taken into consideration:

1. The amount of moisture conserved in the soil and subsoil below the mulch	10
2. The depth, character and efficiency of the mulch and its suitability for the prevention of further losses of moisture by evaporation	10
3. Freedom from weeds	10
4. Regularity and evenness of the surface . . .	10
5. The size and condition of the surface particles and clods	10

The Nhill Agricultural Society has done most valuable work during the past eleven years by means of these competitions. True progress, the writer says, will come, not by increasing the size of the individual holding, but by encouraging higher class farming, and the yearly focussing of the farmers' attention on the merits of the best farms of the district must lead to great general improvement in the farm practice of that district.

778 **Seventh International Dry-Farming Congress.** — *Dry Farming: Official Bulletin*, Vol. VI, Nos. 1 and 3; pp. 1-3 and 89-91. Lethbridge, Alberta, Canada; January and March, 1912.

The Seventh International Dry-Farming Congress will be held at Lethbridge, Alberta on 21-26 October of this year.

Canada The president is Dr. John A. Widtsoe, President of Utah Agricultural College, U. S. A.

The preceding Dry-Farming Congresses were as follows:

The first at Denver (Colorado) in 1907. The second at Salt Lake City (Utah) in 1908. The third at Cheyenne (Wyoming) in Feb. 1909. The fourth at Billings (Montana) in October 1909. The fifth at Spokane (Washington) in 1910. The sixth at Colorado-Springs (Colorado) in 1911. At the latter 30 foreign countries were represented by special delegates.

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

SAVIZKII, I. **Weather Forecasts for 1912 in Russia.** (O Vaxniecscikh Predskasaniakh Prosclikh Liiet i Pogodie Budustciago 1912 g.). — *Selskii Khosiain* (The Agriculturist), No. 10, pp. 462-464. S. Peterburg, 1912. **774**

Russia

One of the most important and difficult problems of meteorology is the drawing up of weather forecasts for the benefit of agriculture; it requires a long and continuous series of observations. By this means, and by the careful examination of meteorological observations collected during 18 years, it was possible to foretell three months before the harvest, the propitious weather of 1909; and to determine as early as the month of September 1910 the intensity and extent of the drought of last year's summer.

The writer, after having regretted the lack of data, especially for Siberia whence the anti-cyclones start, draws up some prognostics for the year 1912, according to which, the spring of this year will resemble the one of last year, with the only difference that all the anticyclones which mark periods of drought, will extend further towards the west.

Those anti-cyclones which last year spread over Western Siberia will reach the central governments, and at the same time high pressure areas coming from the south east will extend to the south western and western governments. — In 1913 and in the following years the anti-cyclones will proceed still further westwards and will reappear ten years later to the east of Russia after having shifted across the Atlantic, North America and the Pacific. In this year, as said above, the anti-cyclones will spread in South Western Russia and notwithstanding their alternating with considerable cyclones, they will cause a marked insufficiency of rainfall for some districts. Though not abundant, the rainfall in the South Eastern Governments and in Siberia will be sufficient to produce fairly good harvests, but towards the West the insufficiency of rain will be more and more marked; long periods of drought injurious to the crops, especially of winter cereals, are to' be expected chiefly between the 10th of May and the 15th of June, in the governments of Tambov, Voronezh, Kursk, Orel, Chernigov, Poltava, Yekaterinoslav, Kherson, Kiev, Podolia, Bessarabia and the western half of the Don.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

775 HILGARD, E. W. **Soils in Arid and Humid Districts.** (Die Böden arider und humider Länder). — *Internationale Mitteilungen für Bodenkunde*, Band I, Heft 5, pp. 415-430. Berlin, 1912.

This article is a study on the physical nature and chemical composition of the soils of arid and humid districts.

United States

In arid districts the rainfall is not sufficient to remove the soluble compounds produced by degradation, so that all or part of them remain, and a saline soil results. In humid regions, which fortunately cover by far the larger area, the soluble salts of sodium, magnesium and lime, injurious to plant life, get washed out. In both cases there remain in the soil carbonates of potassium and magnesium, soluble with difficulty; the alcaline silicates and carbonates first formed react with metallic silicates, present in a very finely divided or colloidal state, to form metallic carbonates and zeolites, thus enriching the reserves of potash in the soil.

Physical characters of the soils of arid districts. — The prevailing structure of these soils, sandy or silty, allows air, roots of plants, and atmospheric weathering to proceed to a very considerable depth. There is consequently no true subsoil on the surface of which a pan can form or salts injurious to plant life be deposited; hence ploughing may be carried to any depth without any pernicious effect on the forthcoming crop.

The penetration of their roots to a considerable depth allows plants to find moisture and nutriment even in times of severe drought; and thus in arid regions the surface 6 to 8 in. of soil, which in other regions is the cultivable and fertile part, has no agricultural importance.

The loose dusty structure of these soils becomes further accentuated by disk-ploughing, but it is valuable in forming a protective layer, diminishing insolation and checking evaporation.

The proportion of humus in arid soils is very low, as it is formed exclusively from remains of roots; this origin explains the increase found in the amount further down in the soil. The leaves and other epigeous parts do not form humus, but become further decomposed by the oxidizing action of the soil and the hot winds. It is found that the humus which does occur is much richer in nitrogen than that of humid soils, containing 10 to 20 % as compared with hardly 5 %; this explains how plants are able to obtain a sufficient supply of nitrogen.

Chemical characters of the soils of arid districts.—Although greater importance is attributed to the physical properties of the soil, yet the differences in chemical properties between arid and humid soils are also characteristic and may be of practical value.

The following table gives the results of many analyses made in various districts of North America.

	Humid soil	Arid soil
	Mean of	
	466	313
	analyses	
Quartz sand and insoluble silicates	84.031	70.565
Silica soluble in soda solution	4.212	7.266
Potash	0.216	0.729
Soda	0.091	0.264
Lime	0.108	1.362
Magnesia	0.225	1.411
Manganese oxide	0.133	0.059
Ferric oxide	3.131	5.752
Alumina	4.296	7.888
Phosphoric anhydride	0.113	0.117
Sulphuric »	0.052	0.041
Carbonic »	—	1.316
Moisture and organic matter (loss on ignition)	3.644	4.945
Total	100.170 (1)	99.993 (1)
Humus	2.70	0.75
Nitrogen in the humus	5.45	15.87
» » » soil	0.122	0.101

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(1) These totals are as given in the original article. (*Ed.*).

Another characteristic of arid soils is their high percentage of lime—ten to fourteen times that of humid soils—which makes any liming unnecessary. For this reason Leguminosae and Rosaceae, which are calciphilous, predominate: large areas in Montana and Dakota are covered with roses, indicating fertile soil. The content of magnesium is also high—six to eight times that in humid soils. A remarkable circumstance in arid regions is that potash is more abundant in sandy soils (wheat lands in California) than in clay soils. Examination shows that each grain of quartz is surrounded by a coat of mixed character, which, owing to its solubility and composition, furnishes an admirable nutritive layer for plants.

The problem of utilization of arid soils resolves itself into the question of irrigation: once water can be obtained, the depth of the soil and the high proportion of utilizable material make these soils more fertile than humid ones, and also less readily exhausted.

It was, perhaps, not due to chance that the early civilizations—Egyptian, Babylonian, Persian—flourished in subtropical regions, where the high capacity of the soil and the need for irrigation encouraged men to undertake diligent and profitable works of peace, while barbarism and war still reigned in the wet forest regions of the north.

776 HEINE, E. **Types of Soil and Fruit-growing.** (Boden und Obstbau). — *Internationale Mitteilungen für Bodenkunde*, Band I, Heft 5, pp. 430-439. Berlin, 1912.

Germany

While the area under fruit trees in Germany has of late rapidly increased in extent, the amount of fruit produced has not everywhere been equally satisfactory.

This probably depends on the fact that in the selection of the sites of the new orchards, two of the most important factors of success, namely the climate and the nature of the soil, have not received due consideration.

As for the first, which is relatively uniform over extensive areas, it will be enough to bear in mind that the majority of fruit trees having originated in warm regions, and so are very sensitive to strong and cold winds, and to sudden falls of temperature. Hence the advisability of selecting, for new orchards, sunny slopes and localities in which it may be possible to protect the trees against frost (by smudging, etc).

Among the trees to be grown, preference must be given, whenever possible, to parthenocarpic varieties.

As for the second factor: the soil, which offers even within very limited areas great diversity of composition, and of conditions for the growth of plants, the following requisites must be considered.

1. — Fruit trees in Germany must have sufficient warmth, hence the importance of the soil temperature.

2. — They require for their development a considerable amount of water.

3. — They produce a quantity of large fruits and consequently require a greater abundance of plant food than forest trees.

4. — Their roots must have for their development a certain depth.

1. *Temperature of the soil.* The most favourable conditions are offered by gentle slopes facing the south, south-west or south-east. Steep slopes must be avoided, because they render all the work in the orchard more difficult, and allow the water to run off the surface too rapidly, leaching out the layer of soil which is richest in organic matter.

2. *Water reserves.* Especially in summer, fruit trees require a great quantity of water. It has been calculated that the volume of water transpired by a cherry orchard (1) during one summer amounted to 1800 cub. met. (2 340 cub. yds.), while the consumption of a pine wood of equal extent amounted to only 240 cub. met. (312 cub. yds). For profitable fruit farming the rainfall must be at least 1 000 mm. (40 inches).

3. *Plant-food requirements.* On this subject sufficiently exact data are available thanks to investigations carried out recently on the initiative of the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft). It is thus known that whilst an average rye crop requires 51 lb. of potassium and 16 lb. of calcium per acre, the respective figures for a well stocked acre of medium sized apple trees are 54 and 50 lb. Pear trees in similar conditions take from the soil 70.5 and 62 lb.; plums 71 and 47 lb.; cherries 56 and 89 lb.

The above data refer to trees of average yield; selected and improved varieties exhaust the soil to a still greater extent. Hence fruit-growing requires a soil rich in humus and abundantly limed. Carbonate of lime is to be preferred, as besides its manurial value it neutralizes the acidity of the soil which is so injurious to fruit trees.

The best soils for orchards are those derived from the decomposition of: *a*) eruptive basic rocks: porphyries, diabases, basalts and their tufa; *b*) limestones with a high clay content; *c*) clay schists. Granite, gneiss, syenite and non-quartzitic sandstones produce rather poor soils.

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(1) Area not given. *(Ed.)*

In Northern Germany the glacial marls decomposed to a depth of at least three feet are very suitable for orchards. Clay soils, owing to their impermeability, and sandy soils, on account of their poverty in plant food, are not favourable to fruit trees.

4. *Development of root-system.* — While for field and garden crops it is often sufficient to till and to manure the soil only to a trifling depth, such is never the case for fruit trees, whose roots must penetrate deeply into the soil. Any impediment to the free growth of their main roots will react unfavourably upon the whole tree, interfering with the exchange of air and moisture between the soil and the roots, and between these and the rest of the plant.

From the above it follows that only soils which are by nature uniformly loose or fissured to a sufficient depth or which have been artificially broken up to the same extent should be selected for orchards.

It will not be out of place to add a few words on the principal fruit trees:

Apple tree. This tree grows well in clay loams containing slight quantities of marl, and in loess.

It requires a good deal of moisture on account of its extensive root-system.

Standard Pear trees, grafted on pear seedlings do not thrive on flat land; they require abundant manuring and irrigation. Being very sensitive to the action of stagnant water and to the lack of sufficient heat, they do not grow well in heavy clay soils.

The *Cherry* develops its roots chiefly in depth and stands drought better than excessive moisture. It thrives on plateaus and on slopes, especially on limestone formations, where the jointing of the rocks ensures sufficient natural drainage. On very moist soils poor in lime, gummosis rapidly sets in.

Egriot and *Plum trees* stand equally well drought and dampness, and show a decided preference for sandy soils with a scanty content of clay.

TILLAGE AND METHODS OF CULTIVATION.

777 **Use of Dynamite in Agriculture** (1). (La Labranza por medio de la dinamita). — *Boletín de la Sociedad de Fomento Fabril*, Año XXIX, No. 1, pp. 39-41. Santiago, Enero 1º de 1912.

The importance of dynamite in agriculture is constantly increasing. Besides its use for felling trees and blowing up stumps (2), it may be used for loosening the subsoil, to excavate ditches, and in certain cases in drainage of lagoons and marshes. Chile

1. *Loosening of subsoil.* — This operation facilitates the passage of water into the deeper layers, thus increasing the amount stored during rain; such favourable results have been obtained at places on the Pacific coast, that subsoil-loosening has taken the place of costly irrigations carried out with water collected in the rainy season.

For this process, holes are dug 13 to 23 ft. apart, and 2 ft. 6 in. to 5 ft. deep; in each 4½ to 9 oz. of dynamite is placed, and the hole is filled in with damp earth. The dynamite is exploded by means of a match projecting from the soil.

The total cost is 48 to 64*s* per acre; this is generally covered by the increase of crop obtained the first year. The results are excellent, not only for cotton and cereals, but also for fruit trees. In this last case the holes are 3 ft. 3 in. deep and the charge of dynamite is 4 ½ oz. at 25 %; if the trees are planted in squares, 15 to 20 ft. apart, one hole is made per tree; if they are 25 to 30 ft. apart, two holes per tree are required; for a still greater distance apart, a circle of 10 to 15 ft. radius is made round each tree, and 3 holes are dug at equal distances on its circumference.

2. *Excavating ditches.* — Holes are dug along the line of ditch to be opened, 2 ft. apart and to 6 to 8 in. below the bottom-level; these holes are sloped at 25 to 45° from the vertical. In each hole one dynamite cartridge (31 × 200 mm.) at 50 % is placed; but in the middle hole three cartridges and a match are placed: the explosion of these three central cartridges explodes the others one ofter another all along the line.

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(1) See *B.* Aug.-Sept.-Oct. 1911, No. 2529: Nov.-Dec. 1911, No. 3135.

(2) See *B.* April 1912, No. 671. (*Ed.*).

In this way a trench 3 ft. wide at the bottom and 5 ft. at the top, and 3 to 5 ft. deep can be opened. If the cartridges are put in two or three parallel rows, the trenches may be made 16 ft. wide at the top and 5 ft. deep.

Dynamite has the advantage of spreading the soil to a good distance and loosening both soil and subsoil, so that drainage water can more easily make its way to the ditch.

3. *Drainage of lagoons and marshes.* In cases where ordinary drainage (tile-drainage, open ditches, etc.) is expensive, vertical wells reaching through the impermeable substratum to a deeper permeable bed may be sunk. For this purpose, holes are dug to a convenient depth, and dynamite is placed at the bottom. It never does to put the dynamite under a layer of chalk, as in that case the explosion merely makes a hole below without breaking the chalk ; if, however, the chalk rests on rock, the dynamite may be placed below it.

MANURES AND MANURING.

778 HOWARD, ALBERT. **Green-Manuring with Sann for Tobacco in India.** — *The Agricultural Journal of India,* Vol. VII, Part. I, pp. 79-83. Pusa, January 1912.

India

In the conservation of soil moisture for the benefit of crops two methods are open to the agriculturist. In the first place, the loss of soil water by evaporation from the surface can be minimised by various systems of surface-cultivation and by the application of mulches.

In the second place, the moisture holding capacity of the soil itself can be increased by the addition of organic matter, in the form of green manure.

Among the crops available for green-manuring in India, *sann* (*Crotalaria juncea*) possesses many advantages. It grows very rapidly, chokes all weeds and does not require any special soil preparation. The rapidity of germination and the rapid growth of the tap root enable the crop to reach the subsoil moisture quickly and to survive without difficulty a break in the rains.

The experience gained at Pusa with this crop as a preparation for tobacco fully bears out the extraordinary efficiency of this practice to increase soil fertility, and it is not surprising that this cheap manure has been taken up by planters and cultivators on a large scale in Bihar.

But the experiment at Pusa indicated also that there is a time-limit in green-manuring after which almost negative results are to be expected. These contradictory results seem to be explicable on the assumption that a loss of fertility follows green-manuring if the interval between ploughing in and sowing is too long. Further experiments in this subject in 1910 showed that when the interval between ploughing in *sann* and planting the tobacco was two months a magnificent crop was produced.

These results appear to indicate the existence of what may be described as a *time-factor* in green manuring with *sann*, and it is possible that the negative results often obtained are due to the existence of this factor. As to the causes underlying the time-factor, in the case of tobacco nothing definite can be said. The matter should be investigated from the bacteriological and chemical standpoints.

Another aspect of green manuring with *sann* is being investigated at Pusa. This relates to the best manner of burying the green crop. Should the *sann* be completely ploughed in, half covered or cut and left on the surface ?

These matters principally affect the heavier lands, in which the general experience is that green manures are less effective than on open sandier soils. Possibly in heavy lands the *sann* should be cut and left on the surface to rot and only turned in, say a month afterwards. Careful field experiments accompanied by detailed and accurate records, as well as laboratory investigations from the chemical and biological standpoints are now in course. The importance of increasing the water-holding capacity and fertility of the soil is so great in India, says the writer, and green manuring is such an easy way of bringing this about, that no pains should be spared to find out experimentally the factors on which success depends.

770 **Pfeiffer, Th. and Blanck, E. Contributions to the Question of the Effect of Manganese upon Plant Development.** (Beitrag zur Frage über die Wirkung des Mangans auf das Pflanzen Wachstum). — *Die landwirtschaftlichen Versuchs Stationen,* Bd. LXXVII, H. I and II, pp. 33-66. Berlin, 1912.

Germany

The numerous researches of O. Loew and his collaborators at the College of Agriculture at Tokio on the stimulating action of manganese on plants have been followed by much research on the same subject, especially in Italy, England, France, Belgium, Austria, Sweden and Germany.

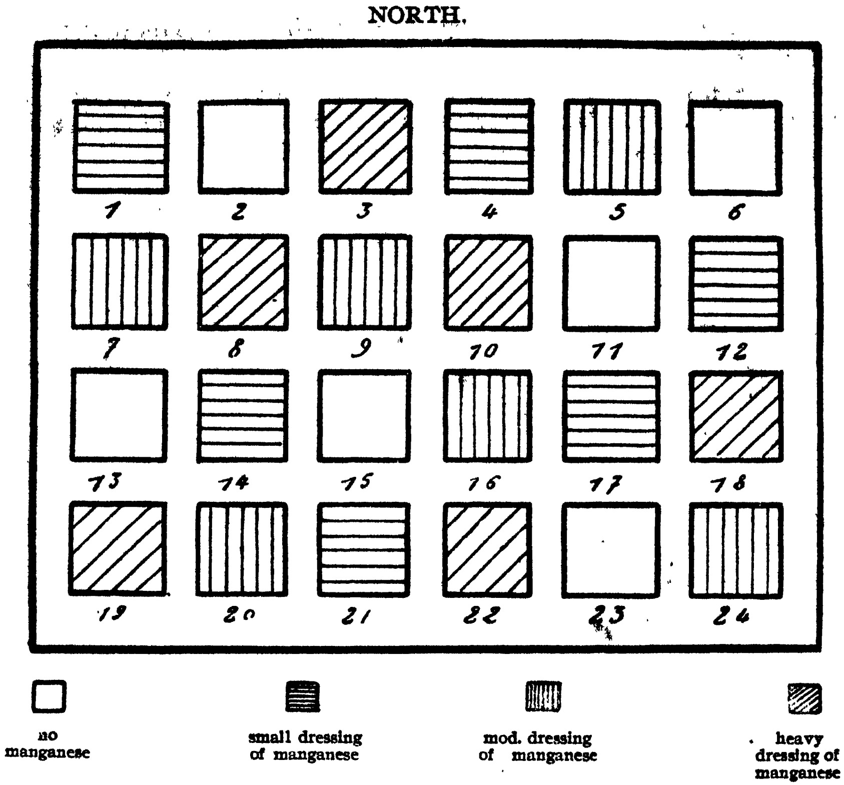
The writers made two series of experiments, one in pots and the other in the open.

Pot Experiments. — Made with oats grown in river sand, with complete manure, and with the addition of 11 % of water. The manganese was added in the form of the carbonate, 33.69 % of manganese, in the proportions per ha. of respectively 142.8, 571.2 and 1142.4 kg. (per acre, 128, 510 and 1020 lbs.) and also of sulphate, 14 % of manganese, in the proportions per ha. of respectively 32.4, 162.0 and 486.0 kg. (per acre, 29, 145 and 435 lbs.).

The beneficial effect of the carbonate only showed itself in the case of the largest dressing, while the two largest dressings of the sulphate were clearly injurious. In any case, allowing for probable errors, no practical conclusions could be drawn.

The analyses of the crops confirmed the stimulating action of the manganese, which caused an increased assimilation of nutritive substances from the soil.

Experiments in the Open. — These were made in heavy clay soil, fairly rich in nutritive substances, especially nitrogen, with addition of a complete manure. The oats were grown after the rotation oats-potatoes-potatoes on 24 plots of 9 sq. m. (96.8 sq. ft.) each, arranged according to the amount of sesquioxide of manganese applied in solution, under the form of sulphate, and in the amount of 10, 20, and 30 kg. per ha. respectively (9,18 and 27 lb. per acre). The amount of manganese was limited, as it appears from experiment that 25 kg. per ha. (22 lb. per acre) is the limit which can be safely used, and further owing to the high price of this substance no useful practical results can be obtained by employing it in larger quantities. The arrangement of the plots is shown in the following diagram.


NORTH.
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no manganese
small dressing of manganese
mod. dressing of manganese
heavy dressing of manganese

On synthesizing the results obtained with the following numerical data, according to the amount of manganese applied, these results express the maximum and minimum differences in the crops:

Amount of Manganese	Small		Average Dry matter		Large	
	kg.	lbs.	kg.	lbs.	kg.	lbs.
Total average .	— 0.57	— 1.254	— 0.13	— 0.286	— 0.27	— 0.594
	± 0.362	± 0.797	± 0.332	± 0.730	± 0.311	± 0.684
Average after elimination of accidental differences . .	— 0.42	— 0.924	— 0.21	— 0.462	— 0.57	— 1.254
	± 0.290	± 0.638	± 0.266	± 0.585	± 0.262	± 0.576

		Nitrogen	
	gr.	gr.	gr.
Total Average	— 7.4	+ 8.1	+ 0.0
	± 6.73	± 7.91	± 6.13
Average after elimination of accidental differences	— 8.2	— 7.5	— 7.2
	± 4.67	± 5.27	± 4.18

From these figures, we can deduce that manganese has no certain beneficial action upon oats.

This experiment made in 1910, was followed by another in 1911 carried out with mangolds sown after a sowing of oats which proved a failure. The results were as follows :

Amount of manganese	Average	Dry matter roots. lbs.	Dry matter leaves lbs.	Dry matter total lbs.	Nitrogen gr:
Small	total	+ 0.242	+ 0.264	+ 0.506	+ 6.0
		± 1.271	+ 0.358	± 1.434	± 17.52
	total after elimination of accidental deviations .	+ 1.474	+ 0.836	+ 2.310	+ 27.8
		± 0.990	± 0.422	± 0.95	± 14.57
Average	total	+ 1.746	+ 0.330	+ 2.046	+ 18.00
		± 1.276	± 0.290	± 1.364	± 15.27
	total after elim. of accidental deviations . .	+ 2.046	+ 0.594	+ 2.640	+ 22.1
		+ 1.080	± 0.219	+ 1.012	± 12.45
Large	total	+ 1.452	+ 0.550	+ 2.002	+ 21.4
		± 0.902	± 0.328	+ 0.922	+ 11.92
	total after elim. of accidental deviations . .	+ 0.572	+ 0.704	+ 1.276	+ 11.7
		+ 0.953	+ 0.321	+ 0.785	+ 11.08

The favourable action of the sulphate of manganese upon the crop and its effect in increasing the nitrogen assimilation was noticeable. The increase in the crop varied between 30 and 127 qls. per ha. (24 to 101 cwt. per acre) of mangolds, the maximum having been obtained with 54 lb. of sulphate of manganese per acre. The figures are not exact, for the limits of posssible error were too great to permit of a definite practical conclusion being arrived at.

In any case, the writers intend making further experiments on the subject, and in order that the uncertainty may not be further increased, care must be taken to estimate the possible errors.

Only by this means can results be obtained which will be of use in practical agriculture.

Amongst others the questions of the action of manganese and of stimulants in general, which are still uncertain, will be investigated by the writers.

From the figures given referring to the work already accomplished in different countries, the present state of our knowledge of the question may be summed up as follows. It cannot be denied, that the compounds of manganese excercise a favourable influence upon certain cultivated plants, but the data hitherto obtained are not definite enough to be of practical value in agriculture.

Sulphur as a Fertilizer.

1*. BOULLANGER, E. Action du soufre en fleur sur la végétation. — *Comptes Rendus des séances de l'Acad. des Sciences*, T. 154, No. 6, pp. 369-370. Paris, 5 Février 1912. 780

2*. DEMOLON, A. Sur l'action fertilisante du soufre. — *Ibid* No. 8, pp. 524-526. Paris, 19 Février 1912.

3*. BERNHARD. Versuche über die Wirkung des Schwefels als Dung im Jahre 1911. — *Deutsche Landw. Presse*, XXXIX J., N. 23, p. 275. Berlin, 20 März 1912.

4*. DEGRULLY, L. Sur l'action fertilisante du soufre (Chronique). — *Le Progrès Agricole et Viticole*, 29 A., No. 11, pp. 321-324. Montpellier, 17 Mars 1912.

The importance of sulphur as a fertilizer of the soil was discussed by Hart and Peterson last year (1).

France. Germany

Recently in the agricultural press of several countries there has been a revival of this question, and from the various publications on the subject the following, which from their experimental character seem to be the most reliable, are selected.

In Boullanger's experiments (1*) pot cultures were made of carrots, beans, celery, lettuce, sorrel, chicory, potatoes, onions and spinach, adding flowers of sulphur to the soil in the proportion by weight of 23 per million. The weight of the produce exceeded that of the control plants by 10 to 40 %. Nevertheless if the soil was previously sterilized and the plants were cultivated in sterilized surroundings the increase obtained by the application of sulphur was very considerably reduced. It appears thus that sulphur acts indirectly, modifying the development of the soil bacteria.

Demolon (2 *) investigated the effect of sulphur, considered also as entering into the composition of crude ammoniac, resulting from the purification of coal gas, which contains from 25 to 50 %, average 40 %, of free sulphur. Experimenting on loam well provided with fertilizers and to which were added flowers of sulphur at the rate of 10 grams per square metre (10.7 sq. ft.), swedes yielded about twice as great a weight of roots, parsnips increased by a half, and mangolds by a quarter; with the two latter the foliage also was produced in much greater quantity. From these results, as well as from those obtained with turnips, the favourable action of sulphur, especially on crucifers, appears clearly. Besides, the more intensely green colour of the foliage on the plots treated with sulphur seems to point to an effect on chlorophyll in addition to that on the bacteria of the soil. From the chemical analysis of soils treated with the residues of the purification of coal-gas and with sulphur, it appears that sulphur in the soil tends to transform itself slowly into sulphates, and this, though exerting only a secondary action, would favour the hypothesis of an effect of sulphur on chlorophyll. Further experiments under the conditions of practical farming are being carried out.

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(1) See *B.* Nov.-Dec. 1911, No, 3130.

Bernhard (3*) reports some experiments conducted by practical farmers. The experiments of 1910, notwithstanding the great heat of that year, exclude any injurious effect of sulphur applied to the soil. In 1911 the results obtained confirm the benefits derived from the use of sulphur in the cultivation of hoed plants, especially against potato scab. Particularly interesting from its practical aspect is the experiment on mangolds arranged as follows:

Manuring.

1. phosphoric acid potash	2. potash nitrogen	3. potash phosph. acid	4. potash phosph. acid nitrogen	5. green manure
		with sulphur		
	with	sulphur and	lime	

The size of each plot was about 600 sq. yards; the quantity of sulphur used: 44 lb. per plot; and of lime about 4 cwt. Valuing the sulphur at 23.10 fr. per quintal (9*s* 3 3/4 *d* per cwt.), the lime at 2 fr. per ql. (9 1/2*d* per cwt.) and the mangolds at 3.25 fr. per ql. (1*s* 3 3/4 *d* per cwt.) the profits on the various plots were the following:

Plots	Profit	Plots	Profit
1. — with sulphur . .	+ 6*d*	4. — with sulphur . .	+ 10*s* 3*d*
» » and lime	— 1*s* 9*d*	» » and lime	+ 7*s* 6½
2. — with sulphur . .	+3*s* 5½*d*	5. — with sulphur . .	— 2*s* 6*d*
» » and lime	+1*s* 2½*d*	» » and lime	— 1*s* 4*d*
3. — with sulphur . .	+3*s* 6½*d*		
» » and lime	+ 7*s* 2*d*		

Sulphur may act on the soil:

a) as an antiseptic, that is, as an anticryptogamic substance, against some specific infections, *e.g* against potato scab.

b) As a sterilizing substance, like steam, sulphide of carbon and other disinfectants (1) by modifying the conditions of life of the soil bacteria.

c) Eventually as a food for cultivated plants.

At the dose of 10 grams per sq. metre (10.76 sq. yds), or about 90 lb. per acre, treatment with flowers of sulphur would be advantageous in practical farming and in market gardening (4*).

Summing up, the effect of sulphur as a substance for improving or fertilizing the soil deserves to become the object of further thorough experiment and research.

FOULKES, P. H. **Radio-Active-Manure** (Experiments carried out at the College Farm 1911: Radio-active Manure). — *Field Experiments at the Harper Adams Agricultural College, Newport, Salop, and in Staffordshire and Shropshire. Joint Report for Season 1911*, pp. 1-31 (18). Shrewsbury, March 1912. **781**

Great Britain: Shropshire

At the request of the Board of Agriculture, a trial was made, both upon mangels and swedes, in order to test the effect of a ratio-active manure.

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(1) Cf. *B.* Jan. 1912, No. 45; March 1912, No. 485. (*Ed.*).

The substance used had the following chemical analysis:

Silica	80.44
Water, volatile organic matter	10.54
Oxide of iron, alumina	2.20
Sulphuric acid, total	5.40
Soluble phosphoric acid	1.37
Soluble salts, soluble free acids	3.32
Uranium	Trace

Samples are variable, especially in free acids and in phosphoric acid.

Activity	0.03 U.
Acidity	65 gr. sulphuric acid per kilo

The radio-active substance was mixed with the other dressings stated below, at the rate of 2 %, and was thoroughly mixed in immediately before the dressings were applied. The compound mixture was sown in open ridges, these being split so as to cover the manures, and the seed was sown on the ridge the same day.

The soil in both trials was a heavy loam lying on a clay subsoil.

Mangels.

Seed was sown on May 4th and the crop lifted on Oct. 28th. The manures applied were as follows:

Steamed bones	4 7/9 cwt.
Sulphate of potash	1 »
Nitrate of soda	1 »
Radio-active manure	2 per cent

A plot similarly treated but *without* the radio-active manure was sown along-side. Duplicate plots were also sown, and the yields per acre were as follows:

	Per acre	
	tons.	cwts.
Complete artificials plus radio-active substance	33	13
» » alone	29	11

Swedes.

Seed was sown on June 1st and the crop lifted on November 9th. The dressing applied was as follows:

Steamed bones	4 cwt.
Superphosphate	3 »
Kainit	2 »
Nitrate of soda	1 »
Radio-active manure	2 per cent

The plots were in duplicate and the average yields per acre were as follows:

	Per acre	
	tons.	cwts.
Complete artificials plus radio-active substance . .	15	11 ½
» » alone	12	15 ½

These trials both on mangels and swedes are to be continued in 1912.

782 GALLEGO, T. **The Consumption of Chemical and Mineral Fertilisers in Spain.** (Consumo de abonos químicos y minerales).—*Ministerio de Fomento.—Memoria relativa à los servicios de là Dirección general de Agricultura, Minas y Montes*, pp. 361-365 + gr. 1. Madrid, 1912.

Spain

The data and information supplied by the Services of Agriculture to the "Ministerio de Fomento" (Report of the Director General of Agriculture, etc.) are of great value to the market, and also in estimating the international consumption of chemical manures; as, hitherto, there was no indication of the amount of these substances used in Spain (1).

It is incontestable that the consumption of chemical and mineral fertilisers increases daily in Spain. This increase is due to the following causes:

1. The information imparted by the official Institutes for Agricultural Instruction and Experimentation by means of demonstration fields, lessons and circulation of printed leaflets.
2. The efforts made by the agricultural press and commercial agencies to extend the use of chemical fertilizers.
3. The relatively low price of these manures, due partly to severe competition, partly to international overproduction.
4. The great development of associations formed for the purchase of chemical products.
5. The beneficial effects of recent official enactments, especially that of the Royal Decree of Dec. 2. 1910, dealing with the conditions of purchase, and the methods of analysing chemical and mineral fertilisers, devised by the Directors of the Alfonso XII Agricultural Institute, and made obligatory for all the laboratories dependent on the "Ministerio de Fomento".

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(1) See for instance: SCHNEIDER, K., *Mineralische Düngemittel und Ernteerträge*. Riga, 1909. (*Ed.*)

This last decree, coupled with an energetic propaganda of rational means of using manures, has, by regulating the sale of chemical fertilizers, contributed to again promote their general consumption, which had momentarily declined, owing to trade abuses and to the unscientific methods of agriculturists.

The present sources of production in Spain are more than sufficient for the demand. The large societies which are interested in this industry look forward to a period of expansion and development, so that these fertilizers may be easily placed on the market and importation greatly reduced. But, as it is a question of raw material for agriculture, it would be difficult for the Government to put any obstacle in the way of importation, even if only intended to regulate prices.

The exact computation of the consumption of chemical fertilizers in Spain is rendered difficult, if not impossible, from the inexplicable difficulties raised by farmers and producers alike. Nevertheless, thanks to the figures collected, at the initiative of the General Department of Agriculture, by the agricultural staff, it has been possible in 1911 to make the first statistical effort in this direction. From data transmitted by telegraph by the engineers in charge of the agricultural sections of the various provinces, it was found that the total consumption of chemical fertilizers in Spain reached the maximum of 581 320 metric tons; the maximum consumption being 82 580 tons, in the Province of Valencia, and the minimum, 300 tons, in that of Orense.

These figures give an approximate idea of the amount of chemical fertilizers used in Spain and their distribution over the different Provinces. These points are well brought out by a diagram added to the text.

To render the information more complete, it may be well to add the import statistics for 1910 (1).

	metric tons
Natural phosphates of lime	106 726
Superphosphates and basic slag	237 302
Nitrate of soda	32 691
Potash salts, sulphates of ammonia and iron	91 784
Guano and other organic manures	3 960

Further, 4 433 tons of sulphate of copper and insecticides were imported. On the other hand 1 834 640 tons of iron pyrites were exported.

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(1) See: Statistiques des importations d'engrais en Espagne en 1910. *L'Engrais*, 27 Année, No. 9, pp. 243-245. Lille, 1er Mars 1912. (*Ed.*)

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

788 SHUTT, F. T. **Wheat and Barley. The Composition of the Grain as influenced by the Soil Moisture-Content.** — *Experimental Farms, Report of the Dominion Chemist*, pp. 165-168. Ottawa, 1911. (App. to the Report of the Minister of Agric.).

Canada

Results of the sixth year of comparative experiments, growing wheat (1) and barley under " dry farming " conditions and under irrigation, carried ont at the Lethbridge Experimental Station, Southern Alberta.

As a basis, the following data on the moisture content of the irrigated and non-irrigated areas are given :

Moisture Content of Wheat and Barley Plots.

Date	Irrigated		Non-irrigated	
	Wheat %	Barley %	Wheat %	Barley %
May 25, 1910	11.57	10.58	11.75	12.99
June 21, 1910	6.73	7.06	7.19	7.68
July 4, 1910	13.62	15.22	7.14	8.17
July 10, 1910	8.87	10.72	6.61	7.74
July 18, 1910	13.20	18.36	6.15	6.74
Aug. 1, 1910	8.19	8.19	5.22	9.47

The plots used in this investigation had been summer fallowed in 1909. The first irrigation was made on June 22 and the second on July 13 ; the seed was sown on April 1. The season being unusually dry, the crop was harvested on August 1.

The results of the analyses of the produce are as follows:

	Wheat	Weight of 1000 kernels gr.	Protein % (N × 5.7)
A	Red Fife, parent seed, irrigated, 1909 .	36.6653	12.31
	» » irrigated, 1910	30.8576	16.53
	» » non-irrigated, 1910	25.8823	16.82
B	Red Fife, parent seed, non-irrigated, 1909.	31.2698	16.13
	» » irrigated, 1910	30.2744	15.22
	» » non-irrigated, 1910	26.1502	17.16

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(1) See *B*. May 1911, No. 1399. (*Ed.*).

Barley

A	Mensury, parent seed, irrigated 1909	39.0392	10.20
	» irrigated, 1910	33.6761	10.26
	» non-irrigated, 1910	27.4728	14.59
B	Mensury, parent seed, non-irrigated, 1909	—	—
	» irrigated, 1910	33.9888	10.20
	» non-irrigated, 1910	28.6248	14.71

The practical conclusions which may be drawn from the above data are here given:

1. That both plots started with practically the same moisture-content, a very fair but not excessive amount.

2. That the non-irrigated area dried out continuously until the grain was harvested. The lowering of the moisture content was more rapid during the first period, May 25 to June 21, than during any subsequent similar period.

3. That on the irrigated area, until the first flooding, the soil was somewhat drier, and that the drying out of the irrigated plots after each flooding was very rapid, from which it is clear that the crops upon them were for the most part in a fairly dry soil and only intermittently enjoyed an abundant supply of moisture.

As for the barley, comparing the moisture-content of the two plots at the outset, the soil of the irrigated area was decidedly the drier. After the first irrigation, the irrigated plots showed considerably more moisture than the non-irrigated.

As regards the results obtained with wheat, the following were observed: in Experiment A, the crops from both irrigated and non-irrigated areas are practically identical in protein content, and very much higher than the parent seed which had been raised on irrigated land the previous season. That the wheat harvested from the non-irrigated area should be richer in protein than its parent was fully expected from the results of the preceding five years, but that the crop from the irrigated plot should be similarly high is probably due to the fact that during the first 83 days from seeding, the soil of the irrigated area was even drier than that of the non-irrigated one. In experiment *B*, though the crop from the irrigated land was found to be about 1 per cent lower in protein than the parent seed, in the main previous results are confirmed.

The experiments with barley lead to the following conclusions:

Experiment *A* shows clearly that the conditions of irrigated areas are distinctly favourable to the development of a low protein barley, and the fact that barley grown on non-irrigated soil is 4 per cent higher in protein than its parent gives evidence that this cereal, like wheat, is readily influenced by soil moisture conditions.

Experiment *B*. The results are practically identical with the preceding.

Summing up, these results prove that the composition of this grain may be profoundly influenced by conditions of growth, probably to a greater extent than wheat, and that protein content is by no means entirely a matter of heredity. In relation to barley, this investigation has a particular and important interest, since a low protein grain is highly prized for malting purposes.

MAXIMOV, N. A. **Chemical Means of Protecting Plants from Frost.** (Khimiceskaia Sastcita Rastenii ot Vemersania). — *Xurnal Opetnoi Agronomii* (Journal of Experimental Agriculture): God XIII, Kniga 1, pp. 1-24. S. Peterburg, 1912. **784**

Russia

The present work is a continuation of the researches of the same author with regard to the effect of concentrated solutions on the resistance of mould to cold, and is connected with the experiments of Lidfors, who proved that the sugar stored in the leaves of evergreen plants keeps them from falling at the first onset of frost.

The method adopted was as follows. Sections, not too thin, were made of the surface of te leaves of red cabbage and *Tradescantia*

TABLE I. — Red Cabbage. Glucose.

Temperature	Concentration						
	$2n$	n	$\frac{n}{2}$	$\frac{n}{4}$	$\frac{n}{8}$	$\frac{n}{16}$	
5.2°	—	—	—	x	x	x	$\frac{x}{2}$
7.8°	—	—	x	x	$\frac{x}{4}$	*ed. x*	*d*
11.1°	x	x	x	$\frac{x}{2}$	*ed. x*	*d*	*d*
17.3°	x	x	$\frac{x}{4}$	*ed. x*	*d*	—	—
22.0°	x	x	*ed. x*	*d*	—	—	—
32.0°	$\frac{x}{2}$	*ed. x*	*d*	—	—	—	—

discolor and immersed for a period from two to sixteen hours in solutions of various substances of different concentrations; they were then frozen in a special apparatus by the aid of saline cryohydrate solutions, in order to keep the temperature constant during the whole experiment. The relative number of the cells still living was then determined by the microscope. The results were set forth in several tables, and those which refer to the glucose, as being typical, are given here.

In these tables x denotes that all the cells remained alive; $\frac{x}{2}$ and $\frac{x}{4}$ indicate the proportion of cells that remained alive; *ed. x.* means that only isolated cells resisted the cold; and *d* means that all the cells died.

TABLE II. — *Tradescantia*. Glucose.

Temperature — Cent	Concentration						
	$2n$	n	$\frac{n}{2}$	$\frac{n}{4}$	$\frac{n}{8}$	$\frac{n}{16}$	0
— 1.0°	—	—	—	x	x	x	x
— 1.6°	—	—	—	x	$\frac{x}{2}$	*ed x.*	*d*
— 2.9°	—	x	x	x	*ed x.*	*d*	*d*
— 3.9°	x	x	x	$\frac{x}{2}$	*d*	—	*d*
— 5.8°	—	x	x	*ed x.*	*d*	*d*	*d*
— 7.8°	—	x	x	*ed x.*	*d*	—	—
— 11.1°	x	x	$\frac{3x}{4}$	*d*	*d*	—	—
— 17.3°	x	x	$\frac{x}{2}$	*d*	*d*	—	—
— 22.0°	x	x	$\frac{x}{4}$	*d*	—	—	—
— 32.0°	*ed. x*	*d*	*d*	—	—	—	—

From these tables it is clear that glucose increases the resistance of vegetable tissues to cold. With solutions of n and $2n$ the sections of red cabbage were uninjured by a temperature of — 22° C., while — 5.0° C. killed the controls. The simple lowering of the freezing point is not enough to explain such a remarkable effect, which is rather due to a certain protective action, analogous to that of sugar and of other electrolytes in the coagulation of albuminoid substances.

The specific properties of the protoplasm of the different plants have no direct influence in this process: sugar solutions injected into the leaves of the tropical *Tradescantia* and of the red cabbage increased their resistance to cold to an equal extent.

In the alcohol group the strongest protective action was obtained from glycerine, though this was never equal to that of the saccharine isosmotic solutions. Methyl and ethyl alcohol were still weaker. The behaviour of mannite is somewhat more complicated. As far as — 2.9° C. it behaves like the sugars; but as the temperature falls its action rapidly sinks to zero; this is because the eutectic point (*i. e.* the point of separation of colloid substances) of aqueous solutions of mannite is very high (— 1.4° C.).

The protective substances cause no modification in the structure and composition of the protoplasm: when they are removed by treating the sections with water, the power of the latter to resist cold sinks to its original level.

SELECTION.

SAUNDERS, CHARLES E. **Selection Experiments at the Ottawa Experiment Station** (Report of the Dominion Cerealist). — *Annual Report of the Experimental Farms*, pp. 137-159. Ottawa, 1911. **785**

As the quantity of material now on hand, which has been produced from crosses accomplished during the past few years, is so large as to be almost unmanageable, no new crosses in cereals were made last season. **Canada**

Some work was done, however, with flax, using as parents the selected strains, now being grown at Ottawa, of which the oil content has been determined.

Apart from the scientific interest, the objects of immediate practical importance in view are to combine, as far as possible, in one variety a large yield and a high oil content with such height of plant as may be most desirable.

Most of the work undertaken is with a view to the production of flax seed rather than of fibre, but the latter feature is not being overlooked.

Attention is given every year to the selection of cereals, not only as part of the necessary procedure to fix the various types produced by cross-breeding, but also in order to obtain improved strains of commercial sorts.

The method employed is that of propagating a series of separate strains, each starting with a single mother plant.

The best strain is chosen after several years' study. This method, which the Cerealist has persistently advocated for some years, is now recognized almost universally as being the best, and the older methods, which involve continuous selection through a series of years, are rapidly becoming obsolete.

The following are data concerning special selection work done with the principal cereals.

Small Plots of Cereals. In addition to the numerous small plots of cereals of cross-bred origin, which are not yet fixed in character, there were grown at Ottawa last year in plots of less than one-sixtieth of an acre·

15 selected strains from named varieties of spring wheat.
186 new cross-bred varieties of spring wheat.
6 selected strains from named varieties of oats.
7 new cross-bred varieties of oats
5 selected strains from named varieties of barley.
68 new cross-bred varieties of barley.
24 new cross-bred varieties of peas.
6 selected strains from commercial sorts of flax.

Making a total of 32 selected strains and 285 new cross-bred varieties.

Spring Wheat. The most important early-ripening varieties of wheat recently introduced are Marquis and Early Red Fife.

Both are beardless sorts similar to Red Fife, but ripening earlier. The kernels of Early Red Fife are indistinguishable from the ordinary Red Fife, but the kernels of Marquis are somewhat shorter and of a slightly deeper colour as a rule.

Both are hard wheats, but the general opinion favours Marquis, which is very successful in the prairie provinces, and is less snbject to rust than Early Red Fife.

Marquis wheat has attracted a good deal of attention outside Canada, and in response to requests, samples have been sent for test to the United States, Great Britain, Austria, South Africa and elsewhere.

Winter Wheat. The best results as regards quality and quantity have been given by the following varieties: Dawson's Golden Chaff (beardless), Turkey Red (bearded), Egyptian Amber, Tasmanian Red and Imperial Red (bearded).

Oats. Amongst the most productive varieties, the following are mentioned: Thousand Dollar, Twentieth Century, Improved American, Banner, Garton's Abundance and Danish Island; they yield respectively per acre, 72 bush. 12 lbs., 67 bush. 2 lbs., 71 bush. 16 lbs., 78 bush. 18 lbs., 65 bush. 10 lbs., and 72 bush. 12 lbs.

The following are some of the early-ripening varieties: Daubeny, Tartar King, Sixty Day and Early Ripe, which reached maturity on July 18, 25, 15 and 17 respectively, having been sown on April 27 and 28.

Barley. Amongst the most productive varieties are: Odessa (78 bush. 36 lbs. per acre), and Manchurian A (68 bush. 6 lbs. per acre). Manchurian is a selected strain of Mensury (77 bush. 24 lbs. per acre). This selection has surpassed in yield the original Mensury. The above two varieties combine a high yield with early maturity, ripening towards the middle of July, if sown on April 22.

Flax. The chief aim of selection, in this case, was to obtain uniformity in the various commercial sorts of flax; thirteen varieties were tested, the average yield of which was 10 bush. 54 lbs. per acre.

Other crops. Experiments on maize, potatoes, beets and carrots complete a programme of work at the Ottawa Experiment Station in 1911 of which the results have greatly contributed to the improvement of Canadian agriculture.

LEHN, D. **Experiments Bearing on the Usual Methods of Plant Selection.** (Experimentelles zur Frage der in der Pflanzenzüchtung gebräuchlichen Methoden). — *Illustrierte Landwirtschaftliche Zeitung:* 32. Jahrg., Nr. 21, pp. 195-196. Berlin, 13. März 1912. **786**

Germany

Up to a short time ago the method of plant improvement by selection in mass—the so-called "German system"—was viewed with much favour. Its application to sugar beets and rye was a great success. But after De Vries, Johannsen and others (1) had thrown fresh light on the questions of variability and heredity, the "Svalöf system" came into vogue. This chiefly consists in making a single separa-

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(1) Cf. *B.* April 1912, No. 644. (*Ed.*).

		Average yield of grain, per plant in oz., or per acre in cwts			Percentage of average grain proportion			Average weight of 100 grains in oz. avoird			N. of the parent plants, or of the offspring, belonging to each group.
		Group I	Group II	Group III	Group I	Group II	Group III	Group I	Group II	Group III	
Table I: RYE.											
	Parent Plants 1909 . . .	0.42	0.54	0.67	42.9	44.6	47.1	0.12	0.13	0.15	11
	Offspring 1910	34.36	35.71	35.63	40.1	40.9	41.9	0.12	0.12	0.12	11
	Parent Plants 1910 . . .	0.41	0.50	0.68	42.6	43.8	45.6	0.11	0.14	0.15	15
	Offspring 1911	26.53	28.33	30.09	37.9	39.0	40.6	0.12	0.12	0.13	15
Table II: HORSE-BEANS.											
	Parent Plants 1909 . . .	0.94	1.16	1.49	40.2	44.2	47.4	1.53	1.93	2.30	19
	Offspring 1910	23.55	22.06	25.60	34.8	36.0	37.5	1.60	1.91	2.12	19
	Parent Plants 1910 . . .	0.95	1.15	1.50	40.6	44.1	50.1	1.50	1.84	2.27	19
	Offspring 1911	22.43	23.18	25.58	26.8	28.5	29.4	1.28	1.49	1.62	19
Table III: WHEAT AND OATS.											
Krafft's Square-head	Parent Plants 1909	0.39	0.54	0.71	36.7	37.8	39.5	0.15	0.16	0.18	9
	Offspring 1910	34.15	32.78	34.59	37.3	37.7	37.7	0.16	0.16	0.17	9
Krafft's Bordeaux Summer Wheat	Parent Plants 1909	0.23	0.24	0.28	26.3	37.9	29.2	—	—	—	8
	Offspring 1910	15.24	15.49	14.07	36.2	24.8	25.8	—	—	—	8
	Parent Plants 1910	0.14	0.16	0.20	30.3	32.1	34.4	0.14	0.15	0.16	7
	Offspring 1911	20.63	17.62	21.20	34.6	34.0	31.9	0.17	0.17	0.17	7
Krafft's Beseler Oats II	Parent Plants 1909	0.42	0.46	0.59	45.7	47.7	49.2	0.13	0.14	0.15	8
	Offspring 1910	34.91	35.75	35.39	36.6	36.5	35.6	0.13	0.14	0.13	8
	Parent Plants 1910	0.28	0.31	0.43	43.3	44.4	45.6	0.13	0.14	0.15	7
	Offspring 1911	33.23	29.53	29.87	43.8	43.8	43.9	0.12	0.12	0.12	7

tion of the forms with subsequent testing of the selective value of the individual forms. The present view is that neither system is in itself the best, but that the method of selection should vary in each case according to the kind of plant.

The work published by the Deutsche Landwirtschafts-Gesellschaft,—" German Agricultural Plant Selection " (Die Deutsche Landwirtschaftliche Pflanzenzucht) — shows that also in the case of self-fertilisation the system which aims at a gradual increase of desirable qualities is in most cases adopted. The figures given in this paper are furnished by Krafft, who has shown that there is no single general principle of selection to be followed, but that the conditions of variability and of heredity must determine the method to be applied. To find out in what way the desired character is transmitted or intensified in successive generations, it is not enough to go back to one ancestor or to a single family; in order to eliminate the effects of external surroundings it is necessary to take into account several individuals and several generations, aud group them so that they may represent, as a whole, average conditions for each set.

In the table on the opposite page the parent plants and the offspring are collected in three groups according to the numerical value of the character to be selected.

From tables I and II it appears that rye and beans in case of heterogamous fertilisation transmit to their offspring their characters, and that, in the same proportion in which they occur in the parent plants. Whereas table III shows that wheat and oats, in case of autogamous fertilisation, show no regularity with regard to the proportion in which the characters of the mother plants are transmitted.

It follows that to improve heterogamous plants repeated selection is required; whereas for autogamous plants, the lineage must be kept pure and the forms carefully separated (1).

PASSERINI, N. **On the Appearance of Bearded Ears in a Beardless Variety of Wheat.** (Sulla comparsa di spighe aristate nelle culture di una varietà mutica di frumento). — *Bollettino della Società Botanica Italiana.* No. 1, pp. 8-10. Firenze, Gennaio 1912. **787**

Italy The writer records the appearance of many bearded ears in a field of the Tuscan variety of beardless wheat called *gentil rosso.*

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(1) Cf. *B.* Jan. 1912, Nos. 76 and 77. *(Ed).*

He ascribes this to atavism, as the seeds were selected with the utmost care. It is noteworthy that in fields of beardless wheat, only long bearded ears are found—there are no intermediate forms. From beardless to bearded forms there is an abrupt leap. Moreover the beards do not change in character; the caryopses of the bearded ears, on being reproduced for three consecutive years, regularly produced long beards, although they were sown in soil where for many years the beardless *gentil rosso* had been exclusively cultivated.

Bearded and beardless ears are not found together on the same plant; only once in 1910 a bearded ear and a beardless one were discovered growing from the same root.

The appearance of bearded individuals is a fact of small scientific interest, but of great practical importance. Serious disputes may arise between the seller of selected seeds and the buyer. The latter, seeing some bearded ears in his fields, supposes that the seed he has purchased is made up of different varieties, and not selected at all; while in reality we have to do with a purely natural phenomenon.

788 HARTLEY, C. P., BROWN, E. B., KYLE, C. H., and ZOOK, L. L. **Cross-breeding Corn (Maize)**.—*U. S. Department of Agriculture. Bureau of Plant Industry. Bull.* No. 218, pp. 5-72. Washington, February 17, 1912.

United States

Because cross-breeding of maize is so readily accomplished, and the results are so varied and interesting, and because cross-breeding is so generally recognized as a very important process in plant improvement, the maize investigations of the Department of Agriculture during 1900 and several years following consisted very largely in cross-breeding all types obtainable. Of the first generation crosses some were unusually productive, some good, some indifferent and some unusually poor producers. Starting selection work with the best, it was found, as the work progressed, that some decreased in productiveness while others retained their high-yielding qualities, and a few have come into general culture as the best grain-producing strains of certain localities.

The influences which show with the greatest uniformity in these tests are those of acclimatisation and adaptation, age and maturity of seed; when these are equal, frequently the first generation cross, *F* 1, is more productive than either parent; it might then be taken as an indication that the character of greater productiveness of one of the parents is prepotent.

This predominance may be made evident and increased by hybridization; hence the importance of crossing in the improvements of maize.

Not all the ears of the same variety have the same value in crossing; some ears when crossed with another variety produce valuable hybrids, and others low yielding crosses, though in general there is a tendency for the different ears of a variety to respond similarly to the crossing.

In conclusion, the determination of the particular first generation crosses that can be most profitably grown is attended by so many complexities that very careful tests must be made in each locality before useful advice can be given to the farmers of that locality as to the greater advantage of continuing to plant a pure bred strain or to plant a first generation cross of certain strains.

MONTGOMERY, E. G. **Correlation Studies of Corn (Maize).** — *Twenty-fourth Annual Report of the Agricultural Experiment Station of Nebraska*, pp. 108-159. Lincoln (Nebraska), 1911. 789

United States

This paper gives the results of numerous experiments made at different Agricultural Stations in the United States for the purpose of determining whether any marked correlation existed between the morphological characters of the plant and useful characters, *i. e.* to find what constitutes a productive type of plant

It is difficult to determine just what constitutes a productive plant. Is it *actual* grain produced, or *relative* amount of grain produced? For example, two plants may each produce 500 grams of grain, but in one case the stalk weighs as much as the grain, while in the other it may be only half as heavy.

Leaf Area. — It was found that the leaf-area could be determined approximately, if the length of the leaf was multiplied by the breadth of the leaf at the widest point, and three-fourths of this product taken. The ratio betwen the actual leaf-area and total weight of dry matter produced varied to some extent.

The amount of leaf-area to one gram of dry weight varies from 2.30 sq. in. with Minnesota No. 13, to 2.66 sq. in. with Hogue's Yellow Dent, when the total weight of the plant was considered; or from 4.39 sq. in. for Pride of the North, to 5.73 sq. in. for Hogue's Yellow Dent, when relation of leaf area to weight of ear was considered.

It seems that a relatively low leaf-area goes with high productivity.

Height of Ear. — A high ear is associated with larger plants and higher actual yield, but slightly lower proportion of ear and very little increase in relative leaf-area. Selection of high or low ears does not affect yield.

Length of Ear Shank. — A long ear shank is associated with a high actual yield of ear (growth correlation, as the plants are larger), and a short shank with a high proportion of ear.

Assuming high proportion of corn to be desirable, a short shank is preferable.

Dimensions of Stalk. — A stalk of medium thickness is best. If either high actual yield, or high relative yield is regarded as indicating a productive type, none of the plant characters studied can be regarded as closely enough correlated with productiveness to justify the grower who wishes to select for increased yield in giving much attention to secondary characters of the plant. The selection of leafy plants in cereals, is often advised on the theory that this is necessary for the production of a large store of carbohydrates. This does not seem to be borne out by the data here presented. On the contrary, the best method seems to be to select large plants with a relatively low proportion of leaf area, since this indicates a high degree of efficiency.

The amount of water transpired by the plants is correlated, to some extent, with leaf area. In regions having abundant rainfall, the leafy type would be desirable, while low leaf types would be better able to withstand drought.

While maize plants show a high degree of variability, yet all characters of the plant appear to vary independently of other characters.

The correlation between actual yield, or relative yield of grain and other characters, is so low that it does not seem that yield could be materially affected by the selection of any other character. Under field conditions, the average size of a plant and the relative sizes of its parts are so modified by local environment, that it is not possible to judge the inherent characters of the plant in most cases.

Plants having an average of 14 % more relative leaf required 7 % more water to produce an equal weight of ear. Where the water supply was abundant, the leafy type gave the highest actual yield, but under limited water supply, the less leafy type was most productive.

790 **Forster Main, T. Broach Cotton Selection.** — *Department of Agriculture, Bombay: Seed Selection Series: Bulletin* No. 46. Bombay, 1911.

The remarkable disparity which exists in a cotton field between the different plants, both as regards size and shape as well as in respect to the number of bolls, has a twofold reason (1) accidental causes; (2) natural causes, transmitted from parent to offspring. **India**

The best type to select in Guzerat is that having the following characters, and no plant should be chosen which owes its superiority merely to some accidental cause.

(1) The plant should be healthy and free from disease of any kind.

(2) It should be robust and vigorous in growth, but not too tall.

(3) There should be ample lateral branching in all directions, and the first branches should start from just so high above the ground level as will prevent the bolls from coming in contact with the soil, and the lower branches should be longer than the upper.

(4) The bolls should be numerous and distributed well up to the tips of each branch.

(5) The bolls should be large in size, and when ripe should open wide, thus setting free the kapas in such a way as to become fully matured and easily picked.

(6) The kapas should be taken out of a few bolls and the fibre should be drawn out from the seed so as to see whether the ginning percentage will be high and the staple long and strong and of good colour.

(7) Seed should be saved only from the best bolls, and not taken from very early bolls, which sometimes open prematurely. The first two regular pickings provide the best seed.

The best method is to select a few of the best plants, and then reject all but one, *viz.*, the best of these. Seed of this plant should be sown by hand, and all the inferior plants arising therefrom in the following season carefully eliminated. The seed of the remaining good plants should be kept for sowing, and the same process repeated. If carefully carried out this system will produce a crop in which the plants are mostly of one shape and size and prolific, and hence the yield of kapas will be greatly increased. In the case of seed distributed from the Surat Farm in 1909-10, the yield of kapas was in some cases 100 lbs. per acre greater than that grown from ordinary seed. This represented a net profit of

Rs 17, or £1 2s 8*d*. In addition the enhanced ginning percentage and good fibre secure the best price in the market.

Moreover plants from selected seed open their bolls so uniformly that three pickings are sufficient, whereas five are necessary for the ordinary crop.

CEREAL AND PULSE CROPS.

791 HOOPER, DAVID. **The Soy Bean in India** (1). — *The Tropical Agriculturist*, Vol. 38, No. 1. pp. 11-15. Colombo January 12.

India. China

The original home of the Soy bean (*Glycine hispida*) is the extreme east of Asia, and it has long been cultivated all over the East between Japan and Java. Since 1885 it has been cultivated in the United States as a forage crop. Within the last two or three years a great deal of interest has been taken in the cultivation of soy and experiments are in progress in government farms in Cape Colony, Natal, East Africa, Gambia, Mauritius and Australia.

In India at the Punjab Exhibition held at Lahore in 1864 soy beans were recorded for the first time. Scientific acclimatisation experiments were made at Madras in 1897, in the United Provinces and in the Central Provinces in 1885, at Bombay in 1901, and in 1905; in most of these experiments, Japanese seed was used.

In the various parts of India soy beans have different names, such as "Bhut", "Bhatmas", "Patani Jokra", "Sudza", "Salyang", "Lasi shapre tum", etc.

Soy beans are generally sown as a kharif (rainy season) crop, in June or July, and the crop is ripe in September or October.

In Japan it is largely employed as a soil renewer and is cultivated in rotation with cereal crops. It is also sown between rows of maize. This method could, no doubt, be extended to India and used in the cotton districts of Bombay and in the tea gardens of Assam.

Soy beans may be divided into two race-groups and eight races. The two race-groups are distinguished by the shape and size of the pods, round or flat, etc.

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(1) See *B*. Nov. 1910, p. 55; June 1911, Nos. 1717, 1718, 1869; July 1911, No. 2105; August-Sept.-Oct. 1911, No. 2554; Nov.-Dec. 1911, No. 3138; Jan. 1912, No. 92. (*Ed.*)

I RACE GROUP. SOJA PLATYCARPA, HARZ., FLAT FRUITED.

1. *Olivacea*, Harz., olive brown soy bean.
2. *Punctata*, Harz., punctated soy bean.
3. *Melanosperma*, Harz., black-seeded, long soy bean.
4. *Platysperma*, black flat soy bean.
5. *Parvula*, Maitens, seed as above, but smaller.

II RACE GROUP. SOJA TUMIDA, HARZ., SWOLLEN FRUITED BEAN.

6. *Pallida*, Roxb., pale yellow, greenish-yellow bean.
7. *Castanea*, brown soy bean.
8. *Atrosperma*, black-seeded soy.

In Manchuria soy beans are classified as follows: —

Yellow bean (Haung-Tow)
Green bean (Ching-Tow)
Black bean (Wu-Tow).

In the Province of Szechuen in Western China the following well-marked varieties of soy beans are cultivated: —

1. *Yellow soy bean* :

a) White yellow bean (100 seeds=18.88 grams): as a rule they are cooked whole as a vegetable.

b) Large yellow bean(100 seeds=23.22 gr.)

c) Small yellow bean (100 seeds=10.65 gr.).

2. *Green soy bean*; there are two kinds of this bean (100 seeds=18.88 gr.).

The yellow and green varieties of soy occupy the ground from April to August, whereas the black kind takes much longer to mature.

3. *Black soy bean*, of which there are two kinds (100 seeds =32.19 gr. and 100 seeds=6.29 respectively).

The soy beans cultivated in India have been grouped into five classes according to their colour, viz., Yellow, Green, Black, Brown and Mottled. These are again subdivided according to their weights.

A. THE YELLOW RACES.

Yellow seeds.—1. *Large yellow Soy Bean.* They are globose seeds (100 weighing from 21.40 to 21.64 grams); probably from China.

2. *Pale Yellow Bean*, globose seeds (100 seeds=16 gr.).

3. *Small Yellow Soy Bean,* globose or ovoid in shape (100 seeds=10 gr.).

4. *Smaller Yellow Soy Bean,* elliptical in shape (100 seeds =7 gr.).

5. *Smallest Yellow Soy Beans.* They are elliptical or reniform in shape (100 seeds=3.5 to 5.9 gr.).

B. THE GREEN RACES.

Green seeds. The ovoid green beans are grown in Poona from Chinese seeds, but they have become smaller in India (100 seeds =11.24 to 15.68 gr.).

C. THE BLACK RACES.

Black Seeds. In these races the epidermis only is black, the inside is yellow.

1. *The large globose race* (100 seeds=21.5 gr.)

2. *The small Black Soy Bean,* with flattish elliptical seeds, is comparatively largely grown in the United Provinces as well as on the lower Himalaya slopes from Kashmir to Darjeeling.

D. THE BROWN RACES.

1. *The large Brown Soy Bean.* — Large, globose (100 seeds =24.66 gr.).

2. *The small Brown Soy Bean.* — Flattish, elliptical in shape; they are grown in the Himalayas from Kashmir to Darjeeling (100 seeds = 7 to 8.5 gr.).

E. THE MOTTLED RACES.

There is only one sample of this yellow and brown race. The seeds are elliptical in form (100 seeds=10.15 gr.).

Both the brown and mottled races have their epidermis only so coloured, the interior being yellow. They appear to have been cultivated for a long time by the natives of Assam and the lower Himalayas. The colour of the brown seeds is called " Khair " from its resemblance to the colour of cutch or catechu.

792 PERRIN. **Rapid Process for the Examination of Beans.** (Procédé rapide d'examen des Haricots). — *Annales des falsifications,* V. Année, No. 40, pp. 80-81. Paris, Février 1912.

France With a view to reducing the time required for the examination of beans suspected of containing cyanogen-producing substances the author steeps in warm water a certain number of the beans which present an irregular shape. He detaches the coat by simply pressing between thumb and fore finger; he crushes the beans in a mortar, and adds to the pulp water and glycerine in equal volumes, after which he examines it under the microscope. Ordinary beans show prismatic cells each containing a crystal of calcium oxalate; these cells are not found in cyanogenetic *Phaseolus*, in which highly refracting cells are found having the shape of a speaking-trumpet or horn and never containing crystals.

This process allows the characters of the two kinds of beans to be rapidly distinguished.

FORAGE CROPS. — MEADOWS AND PASTURES.

BOERGER, ALBERT. **The Question of the Locality from which Clover and other Meadow Grass Seeds are exported.** (Die Provenienz Frage bei Klee- und Grassarten). — *Landwirtschaftliche Jahrbücher*, XLII Band, Heft 1, pp. 1-118. Berlin, 1912. **798**

In the first part of his work, the author attempts to prove that the value of the various clover, lucerne and other meadow grass seeds does not depend exclusively on their good commercial quality (*Gebrauchswert*), but also on certain intrinsic qualities connected with the locality in which they were produced (*Herkunftswert*), and on their adaptability to local conditions (*Bodenständigkeit*). As these conditions differ considerably, seeds imported from other countries may, notwithstanding their good commercial quality, produce inferior plants which do not stand the cold during severe winters, or which under more favourable conditions than in their own home, do not yield as much forage as indigenous plants of the same species, because they lack their intrinsic qualities.

The experiments made in Germany, Denmark, Sweden, Norway, Holland, Austria, etc., prove beyond discussion that red clover does not yield its maximum crops unless locally grown seed be used. As for lucerne, it has been proved that its home has a great importance, but as conclusive experiments are still wanting, it is still doubtful whether "local varieties" thrive better than varieties not yet adapted to the new locality.

Germany The German agricultural association (Deutsche Landw. - Gesellschaft) conducted some experiments with meadow grass seeds, which however did not give decisive results. Nevertheless experiments carried out in Denmark and in Sweden prove the superiority of the home bred grass seeds over the foreign seeds.

In the second chapter, the author values at from 40 to 50 000 tons the quantity of clover and lucerne seeds required yearly by German farmers, and at about half the above figures the amount of other meadow grasses.

As the production of these seeds in Germany tends to decrease and their consumption increases, it is evident that importation supplies a very considerable quantity of such seeds. Without entering into the question of possible frauds and clever manipulations to mask the origin of the seed (such as the admixture of the seeds of certain weeds which the seed-testing stations consider as indications of the countries whence the seeds have been exported), it is a fact that often the most respectable firms can not satisfy the demand for seeds from a given locality, simply because the amount produced is insufficient. It becomes thus necessary to develop this production. The author reviews the measures taken in several countries for the attainment of this desideratum.

Denmark

In Denmark the agricultural associations (which in 1910 were 42 in number) form together a central association (the *Danske land-boforeningers Froforsyning* at Roskilde) which encourages the members of these associations to produce the improved seeds adapted to local conditions. These members are nominated seed producers only on the recommendation of their associations. They are under the supervision of two employés of the central association, who visit them twice a year and also of the members of the agricultural association who know them personally and who have recommended them. The seeds which they produce, after having been cleaned once, are sent to the central depot at Roskilde which pays for them by instalments. At Roskilde the seeds are completely cleaned and sold directly, without employing middlemen, to the farmers.

Every year the Association's seed growers get from the central depot the seeds which they are to cultivate, and in such a quantity as the Association thinks fit. As the cultivation of clover seed is difficult in Denmark it is proposed to cultivate only the most select seed (élite) and to have it reproduced abroad. For this purpose negotiations have been set on foot with farmers in Bohemia.

Sweden

In Sweden, the law of the 9th of February 1909 orders that foreign clover seeds (*Trifolium pratense, T. hybridum* and *Medicago lupulina*) must be artificially coloured, consequently such seeds on crossing the frontier are treated with injections of eosin at five different points of each sack.

In order to promote the culture of choice grass seeds, Sweden has:

1. Ten associations which encourage the production of forage plant seeds on the Danish system.
2. Special state employés for the cultivation of such seeds.
3. Courses of instruction on their cultivation.
4. The above-mentioned law.
5. Seed competitions.
6. Distributions of the best seeds to farmers, on condition that they return at the end of two years an equal quantity of seeds.
7. Experiments for ascertaining which varieties are best adapted to local conditions.
8. A yearly grant of 30 000 crowns (£ 1 650) for the above objects.
9. The systematic improvement of seed carried ont at Svalöf and at Weibullsholm.

Norway

In Norway farmers generally raise the seeds they require; still to develop this culture, the *Konigl. Selskab for Norges Vel* has engaged an expert to teach farmers the cultivation of improved seeds, to supervise their work, to " approve " improved seeds and to promote the formation of cooperative works for the cleaning of forage seeds. A certain number of farmers are nominated " growers of select seeds ".

Finland

In Finland there are 10 associations of agriculturists for the production of the seeds of forage plants. They are united in a central organisation which is generously subventioned by the State, which supervises and directs their work. Every year the central association holds a seed competition at which all the members must exhibit their produce, so as to show the progress achieved.

Russia

There is, besides, a seed culture association in the Baltic Provinces and in the interior of the Empire the seed culture stations at Saratov and at Charkoff attend also to the improvement of lucerne and clover.

Austria: Bohemia

In Bohemia there are 13 cooperative associations which besides the cultivation of barley are interested in the production of select clover seed. It is proposed to sell the seed only in sealed sacks. Improved clover seeds are grown at Chlumetz and other improved grasses at Stephanowitz.

Switzerland

In Switzerland, in the two seed control stations of Zürich and Lausanne, scientific research is being pursued for the improvement of forage crops, but hitherto the cultivation of the improved plants has not been carried out on a large scale.

Holland

In Holland two cooperative associations produce clover seeds, one especially for red clover, the other for white clover. The members of the first, which is the most important, must give information as to the extent of their land under clover to the association, which sends experts to visit the clover fields; when these are found to be up to the standard they are admitted (ankören) to a second inspection. After being threshed the seeds are placed in sacks which are sealed and sent to the depot on a day fixed for the purpose; all the members assemble at the depot to pass judgment on the various seeds, which are divided into four classes. They are sold only to agriculturists.

United States

In the United States there are several institutions for the production and distribution of good seeds.

In the first place must be mentioned the *Office of Seed and Plant Introduction and Distribution*, at Washington, depending from the Federal government. It purchases the seeds of those forage plants whose economic value, for some particular region, has been proved, and then distributes them to official seed control stations, to farmers and even to seed merchants for further reproduction, allowing them to sell their produce, which fetches good prices, thanks to its official recommendation.

The States of Wisconsin, Iowa, and Minnesota have special institutions. When the value of a forage plant has been recognized in one of the experiment farms, the plant is carefully cultivated until a sufficient quantity of seed is produced. It is then distributed to the best farmers of the district (gratis in Wisconsin and in Iowa, and at twice its trade price in Minnesota) for further propagation.

Germany

Since 1897 the German agricultural association (Deutsche Landw. Gesellschaft) and fifteen agricultural associations practise the "approbation" of seeds in the fields in which they grow; but whilst wheat is to a great extent subject to this control, the seeds of forage plants occupy a much less prominent position.

Whilst this "approbation" in the fields guarantees as to the locality in which the seed is raised, it does not indicate whether the plants are derived from foreign seed or from seed adapted to local conditions. This guarantee is better given by associations which use only their own seed. In the last few years associations of this kind have been constituted; among others one at Iphoven in Bavaria, which deals with the improvement of lucerne, deserves to be mentioned.

As means of supplying farmers with good seeds, the author advises:

1. Development of home production.

The experiment stations should study the various forage plants of the country and grow the best local varieties; the higher price paid for such seed would stimulate farmers to extend their production of them.

2. Measures to repress frauds:

a) Constitution of seed culture associations.

b) Inspection of fields.

c) Sale of seeds direct to the farmers, or, if put on the market, the use of sealed sacks.

794 WAKERLEY, F. **Manuring for Milk.** (A Third interim Report on an Experiment commenced in April 1909 and continued in 1910 and 1911). — *The Midland Agricultural and Dairy College, Kingston-on-Soar, Bulletin* 2/1911-12, pp. 23 + chart, plan, and appendix.

Great Britain

Experiments in manuring pastures are generally tested by the increase of the vegetable produce or by the increase in live weight of grazing stock; but in the experiment under consideration the grass was as far as possible turned into milk by cows grazing it, so that the effects of the manures on milk-yield might be determined.

The experiment was carried out on a poor pasture, on heavy clay land. Two plots of 4 acres were laid out; one of these received in April 1909 4 cwt. per acre of superphosphate, ½ cwt. of sulphate of potash. Half a ton of ground lime was given to each.

To carry out this method with success it was necessary to have the cows which converted the grass into milk as even as possible. Four were chosen of equal milk-yield, and put out two on each plot; every fortnight they were changed about, in 1911 four times. Owing to the improvement in the manured plot a third cow was added to it.

The results for 1911, generally unfavourable owing to the drought, were, for the period considered, as follows:

	lbs.
Manured plot: two cows	5860 ½
third cow	3060 3/4
	8921 ¼
Unmanured plot: two cows	5586 ½
Difference . . .	3334 3/4

This difference works out to 81 gallons per acre, and confirms the increase of 84 galls. in 1909 and of 86 galls. in 1910.

Stated on the basis of last years results the figures up to date stand thus:

	£.	s.	d.
1909. 84 gal. of milk ad 6 *d* per gal.	2	2	0
Less cost of producing the same by manuring. .	1	9	0
		13	0
1910. 86 gal. of milk ad 6 *d* per gal.	2	3	0
1911. 81 gal. of milk ad 6 *d* per gal.	2	0	6
Total profit per acre from the treatment . . .	4	16	6

Taking the grazing value of the pasture for each cow at 3*s* per week, or £. 3 per season, we have:

	£.	s.	d.
Unmanured Plot Grazing 2 cows on 4 acres	6	0	0
Per acre . . .	1	10	0
Manured Plot. Grazing 3 cows on 4 acres	9	0	0
Per acre . . .	2	5	0

The annual value of pasture improvement gauged by the rate of stocking, is therefore 15*s* per acre. This amounts to 45*s* per acre in three years, and leaves a surplus of 16*s* after paying for the manures.

An interesting point in connection with this experiment was that the cows showed a decrease in milk yield when they were changed from plot to plot; this decrease was more marked on passing from the manured to the unmanured plot than vice versa; it was accompanied by an increase in the percentage of fat in the milk.

FIBRE CROPS.

795 PÀTIL, P. C. **San Hemp** (***Crotalaria Juncea***). — *Department of Agriculture, Bombay. Bulletin* No. 47, pp. 1-9. Bombay 1911.

British India San or Sann Hemp, called also false hemp, black hemp, etc. and in Marathi Tág, is *Crotalaria Juncea;* it produces a good fibre for ropes and nets. It is used also as fuel where other fuel is scarce, and as a green manure.

It is grown as a soil renewer, as the first crop of a rotation, because it enriches and cleans the soil from weeds. San is grown also as food for cattle.

As examples of the rotations in which san enters, the following may be given:

Krishna Valley. — 1. Tág.
2. Sugar-cane.
3. Tobacco or sorghum.

or

1. Tág ploughed in and followed by tobacco.
2. Sugar-cane.

Násik district.

1. Tág ploughed in, and followed by garlic.
2. Sugar-cane or again Tág for ploughing in.

Konkan.

1. Rice.
2. Tág for fibre.

or

1. Nagli (*Eleusine coracana*).
2. Tág for fibre.
3. Nagli.
4. Tág or Mug (*Phaseolus mungo*).

The cultivation of Tág varies with the object for which the crop is sown, and the climatic conditions of the locality.

Tág grown for fibre occupies the soil for about five months. The outturn in fairly good soil is from 325 to 630 lb. of fibre and from 400 to 600 lb. of seed per acre.

It is commonly cultivated for fuel in the south of the Satara District and in the Kolhapur, Sangli and Miraj States. Cultivation of Tág works in very well with the sugar-cane cultivation, and it is common to see a patch of sugar-cane and a patch of Tág alongside of it. The Tág provides fuel for boiling down the juice of the ripe cane, and at the same time produces a good seed-bed for the new crop of cane. Tág for fuel occupies the ground for a period of 4 to 5 months.

As a green manure, Tág produces 8 to 12 ½ tons per acre. In the case of rice the Tág is sown at the same time that the rice is sown in the seed beds, and is ploughed in quite young before the rice is transplanted.

In the Násik District Tág is extensively used as a green manure for rice, onions and garlic, and to some extent for sugar-cane and wheat.

The method of retting Tág for fibre will depend on circumstances; usually the operation takes from 3 to 7 days.

In the Nasik, Surat and Thana districts the crop is harvested when it comes into flower, and is retted green. In the Ratnagiri District though cut when in flower it is dried before retting. In the Southern Maratha Country the crop is left till dead ripe and is dried in the sun before retting. Tág retted green gives long lengths of fibre, but when retted after drying the fibre breaks in the process of extraction. The fibre of the mature crop, however, is stronger than that of the immature crop. By harvesting early and retting green, a clean, long, but somewhat weak fibre is obtained. By harvesting late and drying the stalks before retting a shorter and dirtier fibre is obtained, but a stronger one, which may be more suitable for home use. By the latter process also seed for sowing and food for cattle are obtained.

SUGAR CROPS.

796 STIFT, A. **The Sugar-Beet in 1911. — Progress in its Cultivation.** (Fortschritte in der Rübenkultur 1911). — *Wiener Landw. Zeitung*, Nr. 17, pp. 199-201. Wien, 28. Februar 1912.

In 1911 a series of studies on the development of the cultivation of beets was published. Among others, the following deserve to be mentioned.

Germany. Austria

Weydemann showed that in consequence of the improvement in drills which drop the seeds in little heaps or at intervals in lines, drilling the seed is strongly to be recommended. Germination is uniform, the vegetation of late beets is more vigorous even after the driest spring weather, and the saving in seed is remarkable.

Vielhaak observes that as beets sown in little heaps must be transplanted earlier, care must be taken not to sow too large an extent of land with this system at one time.

Strohmer, Briem and Fallada prove that the want of light (shade of large trees) favours the development of the leaves to the detriment of the roots, which then contain less dry matter and undergo changes in their chemical composition.

Briem has investigated the life and the importance of beet leaves in their bearing on selection, for the progress of which, further investigations in the anatomy and physiology of beets are necessary.

Andrlik and Urban studied the influence of the plant food in the soil on the composition of beets in their first year. They found that the descendants of the same improved beet (élite) presented a noteworthy variability in their chemical composition, when supplied with excessive quantities of various plant foods under the form of superphosphates, and of potassium and sodium nitrates. This variability was evident both in the leaves and in the roots.

Floderer and Herkè demonstrated that the lowest sugar content is found in the tops of the beet roots, the highest in their central part, and the medium content in their lower end. The sugar content of beet increases from the top downwards until the point is reached where the beet begins to taper, thence it diminishes progressively to the extremity of the root. The parts richest in sugar are the poorest in ash.

Urban investigated the question whether a greater or less nitrogen content is an individual property, depending on the sugar content. He found that it is so; consequently in the scientific selection of beetroots the seed culture stations should consider not only the sugar content but also the nitrogen content.

As for the connexion between the weight and the composition of beets, Plahn observed that between quality and quantity, between heavy crops and the amount of sugar produced, no ratio exists.

The statement that certain beets yield heavy crops containing great quantities of sugar merits but little confidence.

Saillard states that the sugar content of the beetroot and the yield of sugar per acre are characters special to the various varieties, but that the quantity of sugar per acre is no characteristic of the sugar content of the beets. Farmers should always check, on their own land, the results obtained from general experiments.

During the last three years Rath has successfully adopted a system for the production of seed, which not only simplifies the cultivation of the plants, but makes it also considerably cheaper. This system consists in the use of winter mother-plants, which he begins planting from the middle of July to the end of August. He drills and plants in rows 30 inches apart, leaving spaces of 16 inches between the plants.

Briem reviews the progress achieved during the last forty years in the increase of yield; this is resumed as follows:

Sugar making in Hawaii has made such progress that only one kind of sugar is turned out. The use of "motion" crystallizers has become general in Hawaii, because they yield harder and more uniform crystallized granules.

The centrifugal separators used are "Westons", the first one of this type having been built at Honolulu. Owing to the desiccators used the sugar exported does not contain more than 0.5 % of moisture.

In Hawaii the uniformity of the machinery, of the methods followed in analyses, and of the formulae employed, allow of a better use being made of the advantages of chemical control, which has extended its effects to all the plantations. The Hawaiian Sugar Planters Association supports a splendid experiment station for the development of the sugar industry.

Louisiana

The Audubon Park experiment station in Louisiana has tried different methods of cultivating the sugar cane. Before these experiments were made the cane was cultivated in Louisiana in the same way as in Tucuman, excepting for the use of the furrow cultivator. These experiments have demonstrated that by using only the furrow-cultivator and a powerful machine with four plough shares instead of the common plough a much better work was performed and at a lower cost, in consequence of which the planters of Louisiana have adopted the more modern method. Following the example set by Audubon Park, similar experiments were made in Tucuman with the "Morada" and "Rayada" canes, on five plots, which were tilled as follows:

Plot No. 1. With a small plough.
» » 2. » » » » and hoe.
» » 3. As in Louisiana.
» » 4. With plough and disk cultivator.
» » 5. » toothed harrow and disk cultivator.

The results taking the average for the two varieties of sugar-cane were as follows:

Plot No	Canes per acre cwt.	Sugar per acre cwt
1	183.6	14.79
2	159.1	14.40
3	186.5	18.04
4	185.2	17 01
5	226.0	20.12

From the above it is seen that the Louisiana system is advantageous in Tucuman also.

Cuba The soil of Cuba is fertile and yields very heavy crops of sugar cane; it does not require irrigation, though in periods of drought this is very useful, especially when "Caña de Frio" is planted. The installation of a system of irrigation which would enable planters to water their land without difficulty, would be a great advantage. The irrigation canals at present existing in Cuba are not important. Irrigation might be carried out either by a system of canals where the water courses have a sufficient fall, or by means of steam, electrical or gasoline pumps. In 1910-11 the drought injured the cane crop by about 17 % and this loss might have been avoided by irrigation. Irrigation would also allow of more precise estimates being made of standing crops. For the year 1911-12 there are two estimates — one values the probable crop at 1 812 000 tons, the other at 1 874 714 tons. If the crop did not depend so much on the rainfall as it does now, the estimates would be more trustworthy, as they are in Hawaii where sugar canes are irrigated.

Java Statistics for 1911 show that there are 183 sugar factories in operation in Java, of which 67 manufacture white sugar. The white sugar produced amounts to 35.4 per cent of the total production of the island. The question of abandoning raw sugar manufacture is being debated by the Javanese manufacturers.

The reason of the success of white sugar manufacture lies in the fact that it yields sugar equal to refinery sugar without the necessity of redissolving. The product of a raw-sugar factory must be again dissolved in water, the solution decolorized with animal charcoal, again evaporated to crystallisation and the full mass thus obtained centrifugated. This re-dissolution of the sugar is an expensive process, as the evaporation of water requires much heat, and fuel is very expensive in Java.

Experience has shown that the cost of making white sugar is greater than the cost of making muscovado, the excess cost being made up of the following items:

Chemicals	fr.	0.03
Employés.	»	0.01
Wages	»	0 02
Extra packing	»	0 02
Maintenance	»	0 02
	Fr.	0.10

In addition to this excess there is a loss in yield of about 5 per cent.

When muscovado sells at 7 francs and white sugar at 7.47 francs the increased price of the white sugar will just balance the increased cost and loss in yield.

RUBBER, GUM AND RESIN PLANTS.

796 Development of the Cultivation, Trade, and Industry of Rubber in the World.

PERROT, EM. Introduction.
DE WILDEMAN, E. Les Essences caoutchoutifères.
VAN ROMBURGH, P. La Culture du caoutchoutier.
LE JEUNE, VINCENT E. L'Evolution Financière de la Production du caoutchouc.
WRIGHT, HERBERT. Le commerce du caoutchouc.
LANY-TORRILHON, G. L'Industrie du caoutchouc. — *Revue Economique Internationale*, Vol. I, No. 2, pp. 225-350. Bruxelles, 15-20 Février 1912.

Brazil. West Africa. South-East Asia

The amount of rubber produced in the whole world is about 70 000 tons, worth about £28 000 000. Notwithstanding the use of inferior qualities and the manufacture of substitutes, the consumption of rubber has continued to increase. The struggle between wild rubber and plantation rubber is becoming always more severe because the prosperity of many tropical countries, whose chief resource is rubber, is at stake upon the issue.

The States interested in the question of the species of rubber susceptible of cultivation must make a rigorously scientific enquiry in order to determine the best conditions of growth, to select the seed-bearing plants and the seed, to decide upon the methods of tapping and of coagulation, and of industrial exploitation. For *Hevea* the majority of these problems are solved. The rubber States should encourage physical and chemical research on the nature and composition of the latex, as well as on the theory and practice of vulcanising.

The whole problem of the scientific utilisation of rubber plants presents still a number of unanswered queries. The contest between wild and cultivated rubber may drag on for some time to come, so the countries producing wild rubber should hasten to introduce the cultivation of plants adapted to their soil and climate so as to enable them to parry the blow that sooner or late is sure to fall on them.

At present the most esteemed rubber plant is *Hevea brasiliensis* or Parà; it is indigenous to Northern Brazil and is acclimatised in Ceylon, in the Malay States and in the Straits. In the South of Brasil *Manihot* is prevalent, and in Central America as well as in the southern parts of N. America *Castilloas* are the chief rubber plants. After these, may be mentioned *Sapium* (Andes), *Guayule* in Texas and Mexico, and some *Loranthaceae* of Nicaragua and of Brazil with their rubber-bearing fruit.

The most important rubber plant of Asia is *Ficus elastica*, the most useful of the *Ficus* which are found also in America, Africa and Oceania. The commonest lianas of Africa and Madagascar are *Landolphia* and *Clitandra*, and in West Africa the rubber tree *Funtumia elastica* (*Kickxia elastica*) the best of the several *Funtumias* is met with. But no doubt many rubber plants still remain to be discovered. Every country requires special rubber plants and it is not advisable, either from a commercial or an economic point of view to try to obtain everywhere the same product from the same plant, which would entail the risks attendant upon monoculture.

Hitherto, however, it is beyond doubt that the best results obtained by plantation rubber have been yielded by *Hevea brasiliensis* both for quality and quantity.

In those countries where the soil and the climate most resemble those of the home of *Hevea*, the cultivation of this rubber plant offers the greatest probabilities of success, provided the supply of labour be plentiful. The area under *Hevea* in the Malacca peninsula is about 358 000 acres, and in Ceylon, Cochin China and the Dutch colonies about 383 000 acres.

The amount of labour required is enormous; still, Asia with its coolies has nothing to fear from the competition of South and Central American plantations, in which labour is much more expensive.

Of the 75 000 tons of rubber produced last year including "Guayule", 39 000 were Brazil Parà. In 1911 the total production of cultivated rubber was 12 750 tons and this amount will go on increasing, because the *Hevea* plantations are still young. Assuming the area of Asiatic cultivations at only 592 800 acres, containing 160 trees per acre and yielding an average of 900 grams of rubber per tree, Asia alone will produce in the year 1916, 86 000 tons of rubber, that is more than the present output of the whole world. One of the first effects of this will be that Brazil will not be able to exploit profitably its wild rubber. The produce of Brazil and of the less accessible regions of Africa will gradually disappear from the world's markets. Every country must guard against the dangers of monoculture. Plantation rubber will also dispel the illusions entertained about synthetic rubber, which will be much dearer than the cultivated product.

The relative importance of the various regions will be seen by the following review of their yields.

Brazil leads, with 40 000 tons of rubber exported in 1910. But its production being stationary, does not make a further increase seem probable. There are still, especially in Acré, some reserves of *Hevea* and *Castilloa*, but their yield is limited by the exploitation and labour conditions. The forest production of West Africa was 15 500 tons in 1909. Belgian Congo exported in 1910, 3 105 tons of its own produce and about 1000 tons in transit. German East Africa exports chiefly liana rubber. In four years the United States have imported from Mexico about 225 000 tons of *Guayule* bushes.

During the last 10 years at least £48 000 000 of European capital has been invested in rubber plantations in British Malaysia Ceylon, Southern India, Java, Sumatra and Borneo. The menace of eastern rubber has obliged the Brazilian Government to take measures to diminish the cost of Parà, to promote the plantation of *Hevea*, and reduce by 50 % the import duties on food stuffs. At the same time the Government hastens the construction of the Madeira-Mamoré railway for the benefit of the rich rubber regions of the Acré district and of Upper Bolivia.

On the future of rubber, owing to its vast importance, several forecasts have been made; thus it is predicted that while the great financial efforts made in the East by England, Holland, Belgium, France and Germany for the new plantation will limit Brazilian and African competition, they will be the ruin of upwards of six hundred companies that have been formed for the production of rubber.

The Rubber Grower's Association of London calculates the extent of rubber plantations in the whole world at 790 000 acres, from which the yield in 1916 will be 108 000 tons. But in all these calculations a certain margin must always be left for a very important factor, namely labour, which can never be exactly valued for the future.

The yearly percentage of the increase in the consumption of rubber is valued at 5 to 15 and even 20 per cent.

The United States alone possess about 400 000 motor cars, and in Germany their numbers increase yearly by 50 to 60 per cent. Canada aud Japan are now launching into the rubber industry.

Electrical apparatus of all kinds require rubber in ever increasing quantities for its insulating properties, and rubber paving will soon come into general use, besides which hundreds of new applications of rubber are constantly being invented. All this holds out promise of success to the rubber plantations.

With the new applications of rubber and the constantly increasing demand of manufactured rubber, the trade in the raw material is daily becoming more important in the markets of the world. Besides, if rubber is required in certain industries, the rubber works themselves are dependent on other industries and further their development.

Each of the great centres of the rubber trade deals almost exclusively with the rubber of some particular place of origin. Thus Liverpool trades in South American rubbers, London in Asiatic and, considering the future of rubber in the East, it is easy to foretell that the importance of the Liverpool market will soon be inferior to that of London; Antwerpisthe mart for Congo and Amazonian rubbers, Rotterdam Congo and Dutch East Indies, Amsterdam imports chiefly from the colonies of the Indian Ocean. Hamburg receives all the rubber required by German manufactures. Bordeaux has specialised in African varieties, while Havre purchases Parà. New York buys everywhere.

In 1909, 1910 and 1911 the following quantities were imported by the chief centres. The total sum is larger than the amount stated as the total world-production, because sometimes the same parcels of rubber pass from one market to another.

		1909	1910	1911
		—	—	—
Liverpool	tons	22 436	27 601	23 474
London	»	5 435	9 127	12 875
Antwerp	»	4 685	4 058	4 336
Hamburg	»	7 500	7 700	—
Havre	»	3 781	4 458	4 008
New York . . .	»	31 129	32 946	—

The various markets have different methods of sale. — Liverpool and London sell by public auction, Antwerp, Rotterdam and Amsterdam by tender, Hamburg as futures, New York and Bordeaux personally, for immediate delivery. For the examination and valuation of rubber in the various markets, a scientific method of classification will become always more necessary.

It is necessary also to provide each of the markets with a station for the mechanical tests for rubber; something in this direction has already been done in Germany. At Antwerp rubber is well controlled by the " Caisse International d'Anvers ".

The fundamental principle of the manufacture of rubber is based on the chemical changes following on the absorption, at a given temperature, of a certain quantity of sulphur or other similar chemical substance, which process is called vulcanizing. The theory of vulcanizing has not yet been satisfactorily explained. Every kind of rubber must first be washed, purified and dried. Between the gross weight of the rubber as it enters a factory and the weight of the washed, purified and dried sheet there is a difference due to waste which is sometimes considerable. The following table gives the average wastage for various rubbers:

Parà fine Amazons	16	to	18 %
» » Island	18	»	20
Sernamby Manaos	25	»	30
» Peru	30	»	35
Mozambique	15	»	20
Massaï	8	»	10
Niggers	20	»	25
Kasaï	8	»	10
Borneo	40	»	45
Thimbles (grass rubber)	45	»	55
Crêpes	1	»	2½

The rubber, containing the due proportion of sulphur, must be brought to a certain temperature in order to undergo the required chemical and physical modifications. After being vulcanised it is prepared in sheets, the thickness of which varies with the articles to be manufactured.

In order to utilize old rubber, means have been sought for the regeneration of the rubber by depriving it of the free sulphur and other bodies it contains, but hitherto no one has succeeded in removing vulcanisation sulphur without completely destroying the rubber. In Germany however one factory exploits an improved process for the regeneration of the valuable matter which still exists latent in rubber waste, by employing appropriate means for transforming vulcanized rubber which has lost its original property of adhesiveness.

The so-called artificial rubbers (factices) are substances that have nothing in common with real rubber. They are mostly drying oils like the wood-oil of China, vegetable albumen, casein, and gelatin.

The future of synthetic rubber seems very problematic, all the more so considering what has been said above on the subject of plantation rubber.

Rubber in Abyssinia, the German Colonies and the West Indies. 799

1* JUMELLE H. Le Caoutchouc en Abyssinie. — *Journal d'Agriculture Tropicale*, No. 128, pp. 35-37. Paris, 29 Février 1912.

2* Kautschuk in Abessinien. Kautschuk und Guttapercha in den deutschen Schutzgebieten. — *Gummizeitung*, Nr. 23, pp. 892-894; Nr. 25, p. 978. Berlin, 8. und 22. März, 1912.

3* The Future of Rubber in the West-Indies. Plantation Rubber in German East Africa. — *India Rubber World*, No. 6, pp. 259-260 and 269. New York, March 1, 1912.

Abyssinia

The Abyssinian rubbers find their way with increasing regularity to the London market. The amount of Abyssinian rubber imported in 1910 was about 300 000 lbs.

The exploitation of lianes in Abyssinia is a private monopoly, granted by the Government, which derives annually 117 500 lire (abont £ 4 700) from this source. The lianes which produce rubber in Abyssinia are species of *Landolphia* which are found in nearly all forests at altitudes generally between 8 000 and 10 000 ft. The lianes which grow near rivers yield an inferior product. Those which are used are 80 to 100 ft. long. At about 3 ft. from the ground the stem divides into two large branches. In order to obtain the latex, the natives bend the liane down towards the ground and keep it in a horizontal position with ropes; they then make circular incisions, beneath which they place as receptacles the leaves of the *orki* tree. These leaves are warmed in order to preserve the curved form into which they are bent. The rubber obtained is washed, dried for one month in the shade and smoked several times.

Abyssinian rubber is excellent and much appreciated on the London market. The reddish product of the forests of Tsima is of good consistency; the brown rubber from the forests of Gebo-Gebato is softer; the greyish rubber of the forests of Sidamo is also of good consistency, while that from the Gori forests is of an inferior quality.

It has not been determined whether this difference in the quality of Abyssinian rubber is due to its preparation, or to special characteristics of the lianes.

The analysis of a sample made in France gave the following results: 1.8 % water, 0.15 ash, 7.2 resins soluble in acetone. It keeps well for 10 hours at 70° C., and fetches a little more than half the price of Para rubber. There are in Abyssinia many forests which have not yet been exploited for rubber. It is therefore certain that from the present date the exportation of this product will increase, for the industry has a brilleant future before it.

German East africa

Last year the exportation of rubber from German East Africa amounted in value to abont £1 250 000. The districts of Daressalam and Kilwa produce a good rubber in considerable quantities; at Iringa the yield is greater. 329 811 kg. (about 725 584 lbs.) of wild rubber (liane) has been exported. Land for rubber plantation is still in demand. At the close of the year there were 248 plantations containing 25 596 ha. (63 222 acres), planted with 20 558 965 trees, of which 8 602 717 were already in bearing.

Manihot Glaziovii is mostly planted, *Kickxia elastica*, *Hevea brasiliensis* and *Ficus elastica* are cultivated in much smaller quantities. There is a small plantation of *Landolphia* at Langenburg. The methods of tapping and of coagulation are various; the want of uniformity on the subject is regrettable.

There is a refinery at Muheja and a second will be constructed at Tanga. The exportation of cultivated rubber was more than 414 tons.

The Government encourages in every way the development of rubber cultivation. In the Experimental Gardens at Moragoro and Kilossa, nurseries for *Kickxia* have been made, and the Station of Moragoro has had many persons instructed in tapping at Lewa.

In 1911 the number of rubber-trees was the following, classified according to species.

Manihot . .	20 293 779	of which	8 541 662	were in bearing
Ficus . . .	55 000	»	5 000	»
Hevea . . .	6 650			
Castilloa . .	3 600			
Kickxia . .	133			
Various . .	24 811			

Kamerun

During the last year, it was found that rubber formed half the total value of the exports of Kamerun, amounting to 22 222 773 kg. (48 890 100 lbs.). The principal rubber plant in Kamerun is *Kickxia;* very little rubber is obtained from *Landolphia.* The production of this substance alone occupies nearly all the male population of the districts of Lomie, Molundu, Dume, and Dengdeng.

Last year the area cultivated in rubber rose to 95 133 ha. (234 978 acres) from 83 298 ha. (205 746 acres). The plant most extensively cultivated is *Hevea.* While *Kickxia* is more adapted in Kamerun to intercalary cultivation, to planting by the road-side, or to filling up gaps in cacao plantations, *Hevea* offers every advantage for rubber production, and it is also grown there in association with cacao. The necessary seed for new plantations will not be obtainable in Kamerun until 1912-1913.

The Government rubber inspectorate has made gardens for the purpose of supplying seed and plants to the natives, and has also started model farms for rubber cultivation at Akonolinga, Sangmelima, Dume and Djah.

Togo

The export of rubber from Togo fell last year from 136 786 kg. (300 929 lbs.) to 134 919 kg. (296 822 lbs.).

German New Guinea

The area cultivated in rubber in German New Guinea was in April 1911, 2 416 ha. (5 967 acres), of which 765 were bearing, with a total of 763 574 trees, 204 109 of which were already ready for tapping.

The numbers of the varieties of rubber-bearing plants were as follows:

Ficus elastica . . .	387 662	plants
Hevea	221 700	»
Castilloa	148 846	»
Manihot	5 136	»
Various	230	»

The exploitation of gutta-percha and rubber in the forests of Kaiser-Wilhelmsland continues energetically. Five Malays are entrusted with the instruction of the natives in rational systems of tapping and coagulation.

In Samoa, the area of rubber plantations did not increase last year. In 1910-11 all German New Guinea exported 8 649 kg. (19 028 lbs.) of rubber and gutta-percha.

West Indies

The forests of the West Indies can produce cheap rubber similar to that obtained from the Amazon.

It will be a long time before the *Hevea* plantations of the West Indies can be seriously affected by the competition of the new plantations of Middle East Asia.

The West Indies need have no fear of competition, they need only continue to cultivate rubber energetically, for the soil, climate and rainfall are admirably suited to the growth of rubber-yielding plants.

VARIOUS CROPS.

800 **Results of the Purchases of Tobacco made by the Hungarian Monopoly in 1910.** (Az 1910 évi dohánybeváltás föbb eredményei). — *Magyar Dohányújság*, No. 6. Budapest, 16 March, 1912.

Hungary

The total quantities of tobacco leaves, of seven different kinds, bought in 1910 were:

Place of origin or kind	Tons	%
Debreczen Tobacco . . .	28 535.2	43.16
Theiss Valley « . . .	16 339.1	24.70
Szeged « . . .	8 652.5	13.06
Common « . . .	5 899.0	8.91
Garden « . . .	4 413.7	7.29
Szulok « . . .	1 359.3	2.04
Muskatály « . . .	669.8	0.84

(NB. Under the n e "garden tobacco" fine, middling and common leaves, as well as De aves, are included. Muskatály comprizes Szcutandrás also.)

From the above table it appears that Debreczen and the lands bordering on the Theiss supply the greatest quantity of tobacco-leaves, about $^2/_3$ of the total. The kinds that are cultivated there produce abundantly but the price paid for their leaf is inferior to that paid for the other tobaccos.

The prices paid in 1910 were the following:

Place of origin or kind	Per cwt. £	s	d
Garden Tobacco . . .	1	4	11.64
Muskatály «	1	2	11.45
Szulok «	1	0	0.27
Szeged «		19	5.45
Theiss Valley tobacco .		18	1.19
Debreczen « .		17	5.36
Common « .		17	0.87

The yields per acre were the following:

Place of origin or kind		cwt per acre	£ per acre	s	d
Common Tobacco	. . .	12.03	10	5	3
Debreczen «	. . .	11.29	9	16	6
Garden «	. . .	10.74	13	8	1
Theiss Valley «	. . .	10.42	9	8	1
Szulok «	. . .	8.08	8	1	6
Szeged «	. . .	7.45	7	4	5
Muskatály . «	. . .	7.39	6	17	1

These different results may have been influenced by the meteorological conditions of the year 1910 and no conclusions can be drawn from them as to which is the most profitable kind, as the results another year might be different.

One conclusion however can be already deduced, especially for the thick-leaved varieties, namely that their combustibility must be improved. Care must be taken to avoid those causes that tend to produce large leaves, with coarse tissues and prominent nervature, for they generally burn badly and produce a disagreeable odour.

MITCHELL, GEORGE F. **The Cultivation and Manufacture of Tea in the United States.** *U. S. Dept. of Agric., Bureau of Plant Industry.—Bulletin* No. 234, pp. 1-40. Washington, February 15, 1912. **801**

The earliest experiments in cultivating the tea plant in the United States seem to date back as early as the year 1800, but tea-growing on a certain scale began only in 1890. **United States**

The reasons which led to this important experiment were the following:

1. The successful growth throughout the South Atlantic and Gulf States of a large number of oriental trees and shrubs demanding the same conditions as the tea plant.

2. The abundance of suitable labour at moderate cost furnished by colored women and children, for whom it was desired to find some light labour during the summer season.

3. Thousands of acres of idle land, well suited to tea growing, could be made productive.

4. Upwards of $ 16 000 000 sent abroad annually to purchase tea could be expended in paying for a home product.

5. The American people could be supplied with a clean pure article undeteriorated by a long ocean voyage.

Pinehurst, S. C., was chosen as the location for the experiment, and Somerville seemed to present special opportunities for carrying on an educational campaign in favour of American tea.

In its ability to adapt itself to a wide range of conditions, the tea plant is only exceeded by wheat; although this species as a whole has a very wide geographical range, not all varieties thrive equally well in any one locality.

The Assam hybrid and Ceylon teas are better adapted for making black teas, while the Chinese and Japanese teas are more suitable for the manufacture of green teas.

The world's annual consumption, exclusive of the very large local use in China, amounts to more than 700 million pounds. The amounts produced by the various tea growing countries being as follows:

India	250	million	pounds
Ceylon . . .	200	«	«
China . . .	150	«	«
Japan . . .	60	«	«
Formosa . .	20	«	«
Java	17	«	«

Tea is raised also in Natal, in the Russian Caucasus, and to some extent in Jamaica. The people of the United States consume annually upwards of 100 million pounds of tea, for which about $ 16 000 000 are paid.

The climate of the Southern and Gulf States is in general fairly suited to the cultivation of the tea plant, only the rainfall is much less than in most of the tea-producing countries.

An endeavour has been made to supplement the rather scanty rainfall at Pinehurst, but the result thus far has not proved successful owing probably to inadequate supply of water. If the tea gardens were placed on some of the abandoned rice fields of the South Atlantic coast, the old sources of irrigation might be advantageously utilized to remedy any deficiency in this respect.

Although at Pinehurst success has usually followed the attempts to raise seed from most of the foreign teas, the following may be especially recommended as profitable: the "Darjeeling", from the Himalayan slopes, is well adapted for the production of both green and black tea, as are also the Ceylon varieties from very high altitudes. The Chinese variety is especially adapted to the making of green tea, but gives a comparatively small yield. Excellent results have been obtained from a hybrid of the Assamese and

Chinese types, but the tea produced is not of so fine a quality as those before mentioned.

Planting 1750 plants to the acre, each bush averaged one pound of partially dried seed.

There are two systems of planting, namely in checks, either rectangular or in the form of a quincunx, and hedges.

In the East at least twice as many labourers are required as at Pinehurst, where mechanical devices are used; economy rendering it necessary to substitute for hand labour improved and often special forms of agricultural implements.

In curing black tea there are four important operations: Withering, rolling, oxidizing, and firing or drying in a current of hot air.

In making green tea the oxidative fermentation process, through which the characteristic colour and flavour of black tea are produced, must be inhibited as completly as possible.

An interesting experiment has been made at Pinehurst in raising tea under shelter sufficient to protect the plants from the direct sunlight. It is also done in Japan, where the finished product is called « sugar » tea and is highly appreciated. Its content of thein is very large and that of tannin quite small. The leaves attain a very large size, are quite silky and assume a decided blue colour.

In the United States, as in India, Ceylon, and Java, large areas must be planted in order to insure a profitable investment in tea culture, the relative cost of production decreasing as the acreage increases.

The annual production of a tea garden, gradually rising to 300 lb. of dry tea per acre, valued at an average selling price of 30 cents a pound, suffices in 10 years from the starting of the enterprise to liquidate the entire investment.

At Pinehurst comparative experiments were conducted with 12 gardens. Three proved that the successful production of commercial tea upon a sandy soil devoid of humus is practically impossible. Tea gardens must be installed on richer and moister land. With a yield of 250 lb. of dry tea to the acre, the cultivation of tea on suitable soil in the South of the United States becomes remunerative, although burthened, in some instances, by an expenditure of $6 per acre for commercial fertilisers.

802 **Borzì, Antonio. On the Cultivation of Palms, especially of the "Washingtonia" Species, for Industrial Purposes, in Sicily.** (Sulla coltura delle Palme, particolarmente delle specie di « Washingtonia » a scopo industriale in Sicilia). — *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo.* Anno X, fasc. 1-2-3, pp. 102-117. Gennaio-Settembre 1911. Palermo, 1911 [1912].

Italy: Sicily

In this paper the author does not consider *Chamaerops humilis*, the uses of which are sufficiently well known (1), nor the date palm, because hitherto no sufficiently early variety has been found to warrant its cultivation in Sicily. After giving the list of the palms cultivated in the open in the Palermo Botanic Gardens, he proceeds to examine the species of *Washingtonia*, and especially *W. filifera* Wendl., of which he gives a brief historical and botanical notice. He states that it is perhaps the hardiest of all the palms cultivated at Palermo.

It grows on any kind of soil, even on the dune sands; of course in thrives better on good rich clay loams; it prospers in full sunlight and in summer it requires much water. Its rapidity of growth is remarkable; it flowers at about the age of 20 and then it has attained an average height of 10 to 11 metres (32 to 36 feet).

Washingtonia robusta Wendl., whose original habitat is Palm cañon on the northwestern border of the Colorado Desert in California, bears comparison for its hardiness and rapidity of growth with *W. filifera*. Sprengel says that it is a hardy and beautiful palm, of rapid and compact growth, altogether most adapted for extensive cultivation in the South of Europe. It stands the most violent storms, torrential rains, snow, hail and frost. The finest specimen in the Botanic gardens has the following dimensions: Height of trunk 9.50 metres (31 feet); girth at 1 m. (3 ft. 3 in.) from the ground 1.60 m. (5 ft. 10 in.); number of leaves 60.

In the countries where the various Washingtonias grow the natives use their leaves, their fibre and especially their fruit, which is eaten fresh or dried, or transformed, by pounding, into a soft paste rich in sugar. A kind of bread is made from the crushed seeds which are said to have properties resembling those of the cacao bean.

The author, on the strength of the above, counsels the utilization of these palms in Sicily, and in order to demonstrate their economical importance, the Botanic garden has exhibited at the International Horticultural Show at Florence the following products of *Washingtonia filifera*:

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(1) See *B.* June 1911, No. 1206. (*Ed.*)

1. Raw fibre, very resistant and sufficiently white.
2. Objects made with the leaves, such as ladies' hats, etc.
3. Palm shoots pickled in vinegar.
4. Roasted seeds, a good substitute for coffee.

One of the most important products is the wood, which acquires a real economic and industrial value from the rapidity with which this palm can produce very large trunks.

The wood of *Washingtonia filifera* is white when fresh and turns brownish yellow, resembling oak, when dry. Its specific weight is 0.19; it is therefore lighter than so-called cork woods and just barely comparable with real cork, over which it has the advantage of being produced in masses of considerable volume. It can be easily used for making boxes, toys, laths for plasterer's work, etc. It does not take polish, and does not seem adapted for other purposes.

FRUIT - GROWING.

The Ageing of Reconstituted Vineyards in France (Le vieillissement des vignes reconstituées en France). — *Almanach de la Société des Agriculteurs de France*, 22e Année. Paris, 1912. 803

The anxiety which has been caused by the suspicion that the vineyards which have been reconstituted at such a heavy cost after the crisis are showing signs of weakness, is justified, but its importance must not be overrated. **France**

M. Couderc, an authority in these matters, has stated the question in the following words, at the vine-growing congress held at Bordeaux:

« The weakening and the ageing of our vineyards, reconstituted for the greater part on *Riparia*, will oblige vinegrowers to study the best conditions for a new progressive reconstitution.

« This necessity must be contemplated, but without haste, and only to the extent that the slow progress of deterioration will require. That is to say the work will be spread over such a number of years that it will have but a trifling effect on the crops and on the expense of cultivation ».

According to M. Couderc, the substitution of the actual stocks will be accomplished by Franco-American hybrids, because these possess a degree of resistance which others lack.

These stocks are superior to the old ones and afford the grafted vine conditions of vegetation and for ripening nearly identical with those that it would have upon its own roots, besides other advantages such as economy of cultivation and of manuring.

Their resistance to phylloxera has been amply tested; they were produced in France from French parents nearly thirty years ago; they have been tried on a great scale in every part of the French territory for the last 20 years. They are absolutely reliable, and they should be carefully studied, as in the end they will be used exclusively for all high quality wines and to a large extent for many other wines also.

M. Couderc believes also that the influence of the stock is limited to a modification of *nutrition* and nowise specific, nor in any way affecting ampelographic characters.

He further considers that the drawbacks of Riparia become more intense with age in consequence of the settling of the soil, and that if vineyards are wanted to last a long time and to produce regularly very good wines, the so-called *pure* American stocks must not be used, but, according to the soil, some of the stocks included in one of the following lists:

Americo-American Hybrids:

Riparia × Rupestris 3306, 3309, 101-14.
Riparia × Berlandieri and
Berlandieri × Riparia 161-49, 420-A.
Berlandieri × Rupestris . . . none.
Cordifolia × Riparia-Rupestris 106-8.
Solonis × Riparia 1616.

Franco-American Hybrids or French half-bred:

Franco × Rupestris 1202, 404, 93-5.
Aramon × Rupestris-Ganzin.
Franco × Riparia 141-A.
Alicante-Bouschet × Riparia.
Franco-Berlandieri 41-B.

Hybrids one quarter French bred:

Franco × Ruprestris-Cordifolia 62-66.

DALMASSO, G. The Production and Exportation of Fruit in Italy. (La Produzione e l'Esportazione della Frutta in Italia). — *La Rivista*, Anno XVIII, Serie V, No. 7, pp. 145-148. Conegliano, 1 Aprile 1912. **804**

Italy

Fruit-growing occupies an important position in the agriculture of Italy, and several regions of the peninsula derive a considerable portion of their revenue from the sale of fruit.

In every province of Italy, fruit trees are cultivated or at least utilized, but they differ from other cultivated plants in that in Italy they are very rarely grown together in such numbers as to constitute real orchards. The greater number of fruit trees are irregularly scattered in the fields, vineyards, gardens and along roads.

According to the most recent statistics the amount of fruit produced in Italy is given by the following table, in tons:

Year —	Apples, Pears, Quinces, Pomegranates	Peaches, Plums, Cherries	Almonds, Walnuts, Hazelnuts	Dried Figs and Prunes	Chestnuts	Other Fruits
1909 . .	243 294	207 272	202 155	108 754	691 893	408 049
1910 . .	184 537	133 457	275 773	91 629	598 000	246 532
1911 . .	209 241	75 587	155 839	69 878	815 902	175 778

In 1911 Piedmont, Campania and Venetia produced the greatest quantity of apples, pears, quinces and pomegranates. Campania is the region which produces the greatest quantity of peaches, cherries and plums; next come Venetia, Emilia, Liguria, and Piedmont. As for almonds, walnuts, and hazelnuts, Sicily ranks first, producing two-thirds of the total; next come Campania and Apulia. Dried figs and prunes are produced in Calabria, Apulia, Campania, Sicily and the Abruzzi, and chestnuts in Tuscany, Piedmont, Liguria and Calabria.

The total value of the fruit produced in Italy in 1911 was about £ 12 000 000.

The exportation of Italian fruit has considerably increased during the last ten years.

The following table gives the value of the fruit exported in 1911, compared with that of the exportations of the preceding years:

	1911 £	1910 £	1909 £	1900 £
Apples and pears . . .	1 037 551	475 237	1 277 995	337 450
Peaches	79 577	63 024	194 621	
Cherries	76 215	62 131	70 960	
Other fresh fruit . . .	230 720	228 350	238 200	
Shelled almonds . . .	1 430 532	1 591 794	840 950	655 050
Hazelnuts	392 131	340 772	357 793	178 650
Walnuts.	116 921	168 182	112 294	
Dried figs	239 258	205 205	233 693	
Chestnuts	259 347	207 994	173 118	79 400 (1)
Comparison between 1911 and 1900.	3 862 252			1 250 550

Germany buys every year about £ 2 000 000 worth of Italian fruit, consisting chiefly of apples, pears, peaches, apricots, cherries and almonds. In point of importance Austria-Hungary follows (peaches, apricots, cherries, almonds, dried figs and prunes).

The United States purchase Italian walnuts, hazelnuts and almonds. Besides the above mentioned countries, England, France, Russia, the Netherlands, Switzerland and Argentina import Italian fruit.

Notwithstanding the considerable amount of fruit exported, the fruit trade in Italy is still lacking a perfect organisation, especially as regards packing and grading.

805 FRAZER, ROBERT, JR. (Consul at Valencia, Spain). **Packing Valencia Oranges.** — *California Cultivator*, Vol. XXXVIII, No. 7, pp. 196-197. Los Angeles, February 15, 1912.

Spain

The total number of boxes required for the export trade of the principal fruit and vegetable products of the Valencia district, including oranges, onions, mandarins, raisins, almonds, melons and tomatoes, exceeds 14 000 000 annually. To supply material, the pine forests that formerly covered the watershed of the Rivers Turia and Jucar have been used for forty years, and as practically no replanting was effected there is scarcely an available forest tree now standing within 150 miles of this city. A standard orange case of three compartments, measuring 33.37 inches in length, 12.2 in.

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(1) Citrus fruits are not comprised in the above data, being considered, in Italy, as a distinct branch of production and of exportation. (*Ed*).

in height and 15.35 in. in width, costs about 22 cents retail, and has not varied more than 3 cents in value during the past twenty years. When increasing scarcity of timber in the locality or higher transportation rates produced increase of prices, supplies were brought by sea, from the Balearic Islands, from Upper Catalonia and the Spanish Pyrenees, from the banks of the river Minho and from Corsica. With the sole exception of the saw mills, where band saws prepare box shooks, no machinery is employed in harvesting, preparing for the market and transportation or shipping of Valencia oranges.

The gathering of oranges for export usually begins about the 25th of October, when the fruit is only partially colored. The few days it is held in the packing stores and the 8 to 10 days of the voyage to British markets are generally ufficient to complete the pale yellow tint which characterizes first shipments of immature fruit.

Oranges are purchased by packers from the growers by weight or count, according to the custom prevailing in different localities. The standard fruit weight is the Valencia arroba of about 28 lbs., and the count of oranges is per 1 000. Another system of purchase is by sight.

Oranges are gathered in flexible baskets of palm leaf or esparto, and are transported to the packing store in carts of three stories. The lowest is a suspended floor between the wheels, reaching to within one foot of the ground, and each floor accomodates about 16 baskets, each containing 30 to 35 lbs. of oranges. In the store the fruit is piled in heaps 2 or 3 feet high and left to « purge » two or three days. This purging is really incipient fermentation, in which the excess of moisture in the skin of the orange exudes through the pores, leaving it dryer, more flexible and better adapted to the very tight packing in Valencia standard cases, which average about 165 lbs. of fruit each.

Both grading and papering of oranges are done by hand, by women earning 16 to 18 cents a day. Attempts to introduce machines into these departments have not been successful, as they were not considered compatible with the extreme care with which fruit showing the smallest damage must be eliminated in handling. In the great importing markets of Valencia oranges, such as Liverpool, London and Hamburg, 1 per cent of waste fruit in a box is sufficient to have it classified as seconds, which means a depreciation in market value of at least 25 cents per case.

Silk paper for wrapping oranges, formerly imported from France, is now produced locally, mostly at Alcoy, Valencia district. The cost at present averages about 12.50 dollars per bale of 30 reams, which supplies sufficient paper for 250 cases of oranges. The practice, now very general, of having the paper stamped by lithographic printing in gold and colors, with the name and brand of the packer on each orange, adds materially to the expense of packing, not only owing to the cost of printing, amounting to 6 to 13.50 dollars per bale, but also to the additional time necessary to box the fruit symmetrically.

The expenses incurred, exclusive of the value of fruit, to place daily 100 cases of Valencia oranges f. o. b. this port are as follows:

	£	s.	d.
100 box shooks	5	7	0
4 carpenters		9	6
8 women graders		6	4
16 paperers		12	8
8 packers		8	9
4 girls to supply packers with fruit			7
2 girls to carry baskets of papered fruit to boxing dept.			7
Gold stamped paper	1	17	3
Nails		6	4
Cordage to bind ends of boxes			4
Esparto ropes for tying boxes		9	7
25 fruit pickers	1	7	9
Carting fruit to packing stores		19	2
Transportation to shipping wharves	1	18	4
Shipping charges	1	6	2
Total	15	11	4

The usual proportion of the two different grades of Valencia oranges is 60 per cent. of the 420 size and 40 per cent. of the 714 size The latter, which is a smaller sized fruit, is packed in a bigger case, measuring 42 ½ by 14 by 16 inches. Exports of oranges from Spain reached in 1911 about 6 000 000 cases (equivalent to some 14 000 000 boxes of California oranges).

Another form of fruit package for which there is a steadily growing demand on British and Central European markets is the fancy box of Valencia mandarins, containing 25 fruits put up in tinfoil, with laced or embossed paper edging and lithographic chromos; 1 200 000 boxes are annually exported to France. The first cost of the fruit is usually 50 per cent. higher than the orange.

Twenty small boxes are enclosed in a slatted crate for shipping purposes, and in the calculation of freight three mandarin crates are equivalent to two orange cases. The mandarin box is square, each side being 10 to 12 in. long and 1 ½ to 1 3/4 in. high. The tops and bottoms of the boxes are 1/8 in. thick, the two ends ½ in. and the sides 1/5 in. The material of these boxes is imported pine planks, mostly from Austria and Russia. It is customary for the packer to purchase the planks and contract with the saw mill to prepare the shooks at a fixed rate per 1 000 shooks. At present 1 000 planks of 3 by 9 inches standard measurement and 13 feet long cost 830 dollars and yield about 40 000 mandarin box shooks, which the saw mill delivers at a cost of 5.40 dollars for the labor of preparation. An experienced carpenter can put together in a day of 10 hours 1 300 boxes, earning 55 cents.

To pack an average of 3 000 boxes daily some 70 women and young girls are employed at wages of 14 to 22 cents. The workers are distributed in groups of 8 to 12 each under an overseer. Carpenters can be found to contract the whole carpenter work of the 20 mandarin boxes and the covering crate at the rate of 5 cents per crate complete. Crates in shooks cost 15 cents, and are simply two square end boards 5/8 in. in thickness and 8 slats 3/4 in. wide and 3/8 in. thick.

The total cost of materials and labor of a crate of 20 boxes of mandarins placed on the shipping wharf, exclusive of fruit, is about 1 75 dollar each. Tin foil is the most expensive of the materials employed in mandarin packing. The chief source of supply at present is the Netherlands and the current wholesale price is about 49 cents. per pound c. i. f. Valencia for tin foil at 98 square feet to the pound, which supplies sufficient tin foil for some 2 000 mandarins of 2 in. diameter size. The imports of tin foil, cut into squares of about half an inch for the special trade of fancy mandarin packing, amounted in the 1911 season to 33 069 lbs.; which would cover about 30 000 000 mandarins.

POWELL, G. HAROLD. **The Cost of Producing Oranges in California.** (Circular No. 5 of the Citrus Protective League of California). *Report of the Secretary and Manager of the Citrus Protective League for the Year ending December 31, 1911.* **806**

At the beginning of the year 1911 an investigation of the cost of producing citrus fruits in California was authorized by the Executive Committee of the Citrus Protective League of California, and later, a similar investigation was authorized to cover the industry in Italy and in Spain. The lemon industry in Sicily and the orange industry in Spain were investigated in the spring of 1911. At the

United States: California

same time an investigation has been made of the cost of producing citrus fruits in California. The details cover representative groves of all kinds and sizes in every citrus producing section in California. The accounts cover several hundred representative citrus growers and shippers and show in detail the investment in the groves and in permanent equipment and improvements, the cost of the cultural operations, and of handling the fruit, the yields, and the distributing costs of lemons and oranges separately. These data are more extensive than have ever been brought together in connection with an American agricultural industry. They make it possible to compare the foreign industries with those in California and furnish the information necessary to determine the tariff duties needed to safeguard the American citrus interests. The data collected showing the detailed cultural cost of producing oranges in California on 271 groves comprising 8095.9 acres, do not include depreciation on the groves, buildings, stock, machinery, tools, irrigation plant, or other equipment or interest on the investment. The investment in an orange grove represents approximately $1000 per acre; the investment in equipment represents about $60.00 per acre. Four large tables show the cost of labour, including plowing and cultivating, pruning, irrigation, fumigation, spraying, spreading of fertilizers, other tree care, and also superintending and administration where these items were actually paid for.

The average expenditure per acre for materials was found to be $83.24; the average expenditure per acre for labor $52.82. This means that the grower expends on the average in the production of oranges from the beginning of the season until harvesting $136.06 per acre exclusive of depreciation on the equipment and permanent property. The average annual yield of oranges per acre from 1906-7 to 1910-11 on the acreage of the principal orange shippers and associations in California, including from 16 000 to 26 000 acres per year, was found to be 157.6 packed boxes The average annual cultural cost of producing the fruit in the field is therefore $0.8633 per packed box. The cost of handling 4 186 983 boxes of oranges from the tree to the car in 1910-11, including cost of picking ($0.0771), hauling of the fruit from the grove to the packing house ($0.0287), of packing the fruit (0.3246), including labor and materials and other packing expenses and of loading on the car, averaged $0.4304 per packed box. This makes the average f. o. b. cost of a box of California oranges approximately $1.2937. The average number of oranges of all varieties per box is approximately 12½ dozen. The transportation and marketing charges were found to be:

Cost of freight	$0.828 per box
Average cost of refrigeration	$0.789 « «
« « « selling	$0.060 « «

The total cost per box laid down in the market is therefore $2.2706 per box, ($0.181 per dozen oranges). As stated before these figures do not include interest on investment and depreciation.

FORESTRY.

The Expenditure and Revenue of State Forests in India. * 807

India

The relation between the expenditure involved and the revenue realised in all business enterprises is always a most important problem. It is certain that no business which is not supported by sufficient funds can ever pay a proper interest on its capital, while on the other hand the over capitalised concern must always pay a low rate of interest, or even fail to pay any at all. The same principles hold in the management of what are known as the semicommercial departments of the Indian Empire, of which the Forest Department is one of the most important. In the management of forest matters an excessive economy is hardly prudent, for looking at conservative forest management from a purely commercial point of view, it can be shown, that up to a certain point the more money spent on forest establishment and on means of communication and transport, the greater will be the net revenue for unit of forest worked.

What this point may be, for the forests of India, is as yet uncertain, but it is quite certain that in no province which possesses valuable forest has it yet been reached. Nor can it be reached until every acre of forest is being intensely worked and yielding its highest possible quota to the general revenue, at the same time preserving the forest capital in its entirety and bringing it up to its highest yearly revenue, that is, by utilizing only the natural interest of the above capital. (1*)

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* Cf. BLASCHEK, A. D. The Expenditure on Forests in India and its Relation to the Revenue Realised. *The Indian Forester*, Vol. XXXVIII, No. 4, pp. 180-184. Allahabad. April 1912. — This article, which appeared while this abstract was in the press, confirms in the main the conclusions of article (1*) with the exception of the second conclusion. (*Ed.*)

The State Forests of India, in regard to their ownership, extent, and density represent an extreme case, and afford a large and simple basis for the study of the problem.

Including waste land and lands of uncertain conditions, there are at least 500 000 sq. miles of private and communal forests, including those of feudatory rulers within the provinces. Of these 743 sq. miles (1908-09) are entrusted to the Imperial Government and under its control; and in some cases private forest administrations have been instituted.

The forests, however, considered in this abstract are those under the control of the Forest Department and are classified according to the Indian Forest Act of 1878 as follows:

Class of Forests —	1908-09 Sq. Miles	1909-10 Sq. Miles
Reserved forests	94 561	96 474
Protected	8 835	8 814
Unclassed State forests and Public forest lands . . .	138 378	140 263
Total . . .	241 774	245 551

(2*) (3*) (5*) (6*) (7*)

The gradual expansion of the forest revenue, expenditure and surplus is shown by the following table, containing the data collected during a sufficiently long period, 25 years ·

	Five years period				
	1884-1885 to 1888-1889 Rs.	1889-1890 to 1893-1894 Rs.	1894-1895 to 1898-1899 Rs.	1899-1900 to 1903-1904 Rs.	1904-1905 to 1908-1909 Rs.
Average revenue	1 16 68 148	1 59 49 015	1 77 15 756	1 96 58 421	2 57 03 161
Average expenditure	74 26 956	86 03 351	97 96 140	1 12 69 486	1 41 05 829
Average surplus	42 41 192	73 45 664	79 19 616	83 88 935	1 15 97 333
Proportion of expenditure to gross revenue.	63.7	53.9	55.3	57.3	54.8
Proportion of surplus to gross revenue (per cent).	36.3	46.0	44.7	42.6	45.1

In order to study the problem more closely in its details, the data per square mile in the various provinces during the five years from 1904-05 to 1908-09, showing the connexion between expenditure incurred and revenue realised, are given in the following table:

Province	Total expenditure per square mile	Percentage of expenditure to gross revenue	Total net return per square mile
	Rs.		Rs.
Bengal	76	48.0	83
United Provinces	313	50.1	311
Punjab	119	45.2	144
Burma	28	37.7	47
Eastern Bengal and Assam	25	41.0	36
Central Provinces and Berar	66	59.6	44
Ajmer	118	43.0	157
Baluchistan	79	74.3	44
Andamans	142	58.0	102
Madras	127	71.4	50
Bombay	142	39.9	214

Two provinces have been omitted: Coorg, because owing to the great value of its principal timber, sandalwood, it yields an exceptionally high return, 262.6 Rs. per sq. mile, — and the North West Frontier Province for the same reason (deodar timber), 480 Rs. per sq. m.

Certain facts appear clear from the above. First it is evident that the financial position in any province cannot be judged by the percentage of expenditure to gross revenue, as this varies considerably according to the value of the yield, the means of extraction and their cost, and the rights and privileges of the people.

This financial position may on the contrary be judged by the net revenue for unit of area, inasmuch as where the forest produce is valuable and not yet fully worked, increased expenditure will be followed by increased revenue.

Turning now to the technical and financial bearing of the various items of expenditure, the following table gives the averages of the five years ending 1899-1900 compared with those of the five years ending 1908-09:

Details of expenditure	Five years ending 1899-1900	Five years ending 1908-09
Total forest expenditure	1 12 69 486	1 41 05 829
a. Forest settlements, surveys and demarcations	5 96 814	4 76 133
b. Extraction, and construction of roads and buildings	5 03 401	10 54 645
c. Fire protection	4 09 837	5 81 056
d. Cultural operations	3 53 845	5 65 914
e. Forest science and education	73 088	1 24 162

In the total expenditure, direct and ordinary expenses, namely those that produce immediate returns, are naturally prevalent. Among these the most important are those incurred for establishment: thus an increase on establishment charges of Rs. 28 74 256, or nearly 50 %, during the past 20 years has produced a corresponding increase of Rs. 42 01 130, or upwards of 30 % on the net annual revenue realised. The increase on establishment is absolutely necessary if conservative forest management is to accompany increased revenue.

The items *a*), *b*), *c*), *d*) and *e*) of the total expenditure represent the indirect or not ordinary expenses which do not produce immediate returns, but if any one of them receive insufficient attention the forest estate will not bring in to the Department or to the people the full advantages which may be expected from it. This capital expenditure will become less and less as time goes on, but will not cease in India for a long period of years yet; and this explains how the percentage of expenditure to gross revenue is much higher than in those countries where the forests are regularly managed and where the expenses of settlement have been made long ago, and where all the branches of forest economics and education are completely developed, as, for instance, in Germany.

Among the above expenses, those incurred for improving the means of communication cause the most rapid increase of revenue. The same cannot be said of the expenditure for forest scientific research and education; nevertheless these charges have risen in the 10 years from 1899-1900 to 1908-1909 from Rs. 73 550 to Rs. 183 191.

This increase is chiefly due: *a*) to the endeavours that have been made to improve the education given to rangers and to the staff in the provincial service, it being a recognized fact that any undue economy in this direction must have a most injurious effect on the country as well as on the forest revenues; *b*) to the creation of the Forest Research Institute at Dehra Dun with the object of discovering new sources of revenue and thus increasing the profits of the Forest Department. Already numerous investigations are in progress on the utilisation of tannin extracts, of various woods and fibres for the manufacture of paper, of timbers not yet utilised, and on the development of the match-making industry in India (4*) (9*).

The development of the utilisation of the forest wealth and consequently of the revenue in its principal items may be seen from the following figures:

	Averages	
	1892-1893 to 1896-1897 cub. ft.	1904-1905 to 1908-1909 cub. ft.
Timber	45 491 226	59 459 969
Fuel	104 337 489	116 574 182
Timber and fuel	149 828 715	176 034 151
» » » per sq. mile . . .	2 114	2 328

The value of the minor forest produce rose from Rs. 34 60 464 in the five years ending 1903-04 to Rs. 48 29 631 in the five years ending 1908-09.

From the above data, the experience of past years, and the considerations which have been brought forward in this paper, the following conclusions may be drawn, which will be applicable to other countries also, in proportion to the extensive character of the forest technique and economics, with special reference to public forests (8*).

Conclusions (1*)

I. That a low percentage of forest expenditure to gross revenue cannot be considered as proving satisfactory management from a financial point of view.

II. That this must be judged by the net revenue realised per unit of forest concerned, and that the best results from this point of view cannot be realised without a high percentage of expenditure to revenue, and consequently a high expenditure per unit of surface.

III. In order to increase the net forest revenue it will be necessary to increase the expenditure, chiefly on establishments and means of comunication, especially in regions where there is a valuable produce, and which are not yet worked to their full capacity: then, such an increase of expenditure will lead to an increased net revenue per unit of area and eventual decrease in the percentage of revenue to expenditure.

IV. That undue economy in expenditure on education and research must result in injury to the forests and the country, and in the failure to open out new sources of revenue.

V. When, finally, large tracts of forest are managed, as in India, for the benefit of the people, considerable expenditure is necessary for their management and protection, even when the return is not received in the shape of revenue, but in the fact that the people receive free of payment a considerable quantity of forest produce, the value of which, in India, amounts to more than 45 lakhs of rupees per annum.

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(3*) *Idem, for the Year* 1909-1910, pp. II + 49. Simla, 1911.

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(7*) Forests. — *Statement exhibiting the Moral and Material Progress and Condition of India during the Year* 1909-1910.

(8*) *The Times.* The Forests of the Empire. — *The Indian Forester*, Vol. XXXVII, No. 12, pp. 665-669. Allahabad, December 1911.

(9*) Cf. also: *B.* Nov. 1910, pp. 102-103; April 1911, Nos. 1199, 1207; May 1911, No. 1446; June 1911, Nos. 1789, 1792; Aug.-Sept.-Oct. 1911, Nos. 2704, 2725; Nov.-Dec. 1911, Nos. 3169, 3176.

LIVE-STOCK AND BREEDING

HYGIENE.

808 Holczer, Lajos. **Recent Data on Inoculations against Swine Fever** (1). (Ujabb adatok a sertéspestis elleni vedöojtáshoz). — *Allatoroosi Lapok*, No. 8. Budapest, 24 February 1912.

Hungary

The author reports upon the results of the inoculation of pigs with *Budapest serum* against swine-fever.

On the 25th of July a herd of 365 three-month-old swine were attacked by fever; 15 died before the 30th of the same month, on which day each of the 350 remaining pigs received an injection of 8 cc. of serum; at the time that the inoculation was carried out 50 pigs were already attacked by the disease, the remainder appeared to be still sound. Up to September 24, none of the latter died, while of the 50 already attacked 38 perished.

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(1) See *B.* April 1912, No. 675. *(Ed).*

On September 9, 1911, a herd of 564 three-month-old pigs was attacked by fever, and by September 22, already 22 had died. 450 of the still healthy animals were inoculated; 58 of the healthy pigs and 34 already affected animals were not vaccinated. On November 30, the losses were as follows: 72 of the vaccinated pigs (= 16 %), 21 of those that were still healthy on the day that the vaccination was made but which had not been vaccinated (= 36.2 %), and 19 of the pigs that were already diseased but had not been vaccinated (= 55.8 %).

On September 25, 1911 a herd of 400 pigs, eight months old, were inoculated with 12 cc. of serum per head. Up to the month of January 1912 not a single pig died, only two or three fell ill, while before the inoculation 30 or 40 of the herd had died.

These results are very favourable, when it is considered that the disease often carries off 50 to 70 % of the animals. Though inoculation confers only a passive immunity lasting only 4 to 6 or 8 weeks, an active immunity is attained when the pigs that have contracted the disease by natural infection recover.

In order to favour this active immunisation it is advisable to remove from the herd the animals that are severely attacked, but to leave all the animals in the same infected locality.

PIETTRE, M. MAURICE, and ROUX, M. E. **A Nematode of the Fibrous Tissues in Cattle.** (Sur un Nématode des tissus fibreux chez le Bœuf). — *Comptes rendus de l'Académie des Sciences*, Tome 154, No. 9, pp. 620-623. Paris, 26 Février 1912. **809**

France

The authors found, in several head of cattle, in the fibrous tissues of the knee joint, and especially in the lateral and capsule tendons of this articulation, a parasite which hitherto had not been observed in Europe. This parasite causes on the above tissues yellowish while streaks which appear under three forms:

1. Simple dissociations of the fibrous bundles.
2 Small cavities in the tendons.
3. Nuclei of conjunctive tissue formed by inflammatory reaction, and somewhat darker in colour than forms 1 and 2.

All these tissues contain parasitic worms in different stages of evolution—living, dead and even sclerosed. The food of these worms consists of the products of the destruction of the tendons, as is proved by the presence of such matter in their digestive canal.

The male is 4 to 8.5 cm. (1.57 to 2.16 inches) long and 85 to 95 μ thick. The female appears to attain the length of 26 cm. (10.23 in.), with maximum thickness of 260 to 190 μ; it bears embryos, hatched in the uterus, 230 to 265 μ long.

The authors have classified these nematodes in the genus *Onchocerca* (Diesing), family of the *Filaridae.*

They believe it probably identical with *Onchocerca gibsoni*, discovered in 1910, and with *Onchocerca gutturosa*, discovered also in the same year. They propose, as soon as the identity is proved, to classify the three under the name *Onchocerca bovis.*

810 THEILER, A. **Treatment for Gall-Sickness and Redwater in Cattle.** (Gall-Sickness of Imported Cattle, and the Protective Inoculation against this Disease. The Transmission of Gall-Sickness by Ticks). — *The Agricultural Journal of the Union of South Africa*, Vol. II, Nos. 1 and 2, pp. 1-21 and 173-181. Pretoria, January and February 1912.

Union of South Africa

By a series of experiments the author has proved that the two parasitic diseases of South African cattle, redwater and gall-sickness are caused by two different species of trypanosome, namely *Piroplasma bigeminum* which causes redwater, and *Anaplasma marginale*, gall-sickness. The immunisation of European cattle imported into S. Africa against one of these diseases is not sufficient, as the animals are still susceptible to the other.

The author states that according to the results of his experiments it is possible to immunize cattle against both diseases simultaneously by a single subcutaneous injection of 5 cc. of blood containing both parasites.

During the period of reaction to redwater (about 15 days) the animals must be carefully watched, and in case of an excessively severe reaction an injection of trypan blue must be resorted to; gall-sickness having a longer period of incubation produces reaction between 16 and 40 days after the injection. If the inoculation be made with a not very virulent *Anaplasma*, no injurious effects are to be feared, provided the animals are well fed.

Subsequent investigations have proved beyond doubt that the two diseases are transmitted, either together or separately, by two species of ticks, the blue tick (*Rhipicephalus boophilus*) and the black-pitted tick (*R. simus*). Although the immunisation of cattle against these diseases is a valuable method of defence, the complete destruction of ticks is the most radical remedy, and should be most warmly recommended.

ANATOMY AND PHYSIOLOGY.

BURNETT, E. A. **The Effect of Food on the Strength, Size, and Composition of the Bones of Hogs.** — *Twenty-fourth Annual Report of the Agricultural Experiment Station of Nebraska*, pp. 178-208. Lincoln, Nebraska, U. S, A., 1911. **811**

United States

The first feeding experiment was made with fifty hogs, in five lots of ten each, and it lasted from December 12, 1908 to March 4, 1909. The individuals were marked at the beginning of the experiment by metal tags fastened to the ears. At the packing house the tags were accidentally removed from 9 hogs, consequently the data on the bones are collected from only 41 animals.

A second feeding experiment began on September 15, 1909, and ended February 5, 1910. At the beginning of the experiment there were five hogs in each of the five lots. On the 20th of November the poorest hog of each lot was taken out, thus reducing the total number to fifteen. The foods given are stated below in the table.

In both tests the hogs were killed by the same packing firm. The carcasses were hung for forty-eight hours in the cooler, when the humerus, radius and ulna, and femur and tibia of each hog were removed, and being properly labelled, were forwarded to the Experiment Station, where they were cleaned, and their length, circumference, weight, volume, and specific gravity determined.

Then their breaking strength was ascertained by an improved testing machine, and the broken bones were used for the determination of the wall thickness and, by two analyses, the percentage of mineral matter.

The following table summarises the results obtained.

In both tests the weakest bones were those from hogs fed with corn only. The addition of alfalfa meal slightly increased the

Lot No.	RATIONS USED	Live weight per hog in lb.	Breaking strength of bones in lb.	Weight of bones examined per hog in grams	Specific weight of bones	Wall thickness of bones in mm.	Percentage mineral matter in green bones
Summary of 1908-1909 test (1). Average live weight at beginning of experiment 140 lb.							
1	Ground maize 100 %	164	763	985	1.301	4.6	37.88
2	Ground maize 90 % Alfalfa meal 10 %	196	780	1 146	1.231	4.8	37.65
3	Ground maize 85 % Alfalfa meal 10 % Tankage 5 %	193	963	1 190	1.361	5.1	41.32
4	Ground maize 85 % Alfalfa meal 10 % Bone meal 5 %	171	981	1 244	1.360	5.4	42 56
5	Ground maize 75 % Alfalfa meal 10 % Shorts 5 %	175	822	1 045	1.293	4.9	39.79
Summary of 1909-1910 test (1). Average live weight at beginning of experiment 60 lb							
1	Ground maize 100 %	136	371	832	1 143	2.2	30 04
2	Ground maize 85 5 % Alfalfa meal 10 % Bone meal 4.5 %	207	795	1 143	1.333	4 3	44.15
3	Ground maize 90 % Alfalfa meal 10 % During first month: calcium carbonate 1 ½ %	144	396	975	1.167	2.3	32.06
4	Ground maize 86.6 % Alfalfa meal 10 % Disodium phosphate 3 4 %	155	476	986	1.216	2.7	35.01
5	Ground maize 85 5 % Alfalfa meal 10 % Tankage 4.5 %	243	684	1 094	1.320	3.0	39.89

(1) All these figures are averages.

strength. The further addition of shorts gave a noticeable increase, while the addition of tankage (1) and especially bone meal gave a very marked increase.

FEEDS AND FEEDING.

Farmers' Opinions of Silage (2). — *Farmer and Breeder*, pp. 223-229. Sioux City, Iowa. Feb. 29, 1912. **812**

BAKER G. H. F. Silos and Silage. — *The Journal of the Department of Agriculture of Victoria, Australia,* Vol. X, Part I, pp. 15-22. Melbourne, Jan. 10, 1912.

United States. Australia

In the above number of *Farmer and Breeder* seventeen letters are published from farmers and stockmen giving their experience of ensilage for farm live stock. There has been a great development of ensilage in the United States, especially in Iowa, South Dakota and Nebraska, and it is still on the increase.

Besides their silos for winter food some farmers have built smaller ones for use during the hot months of August and September, when green food runs short.

There is a general agreement as to the good effect of ensilage on the yield of milk. The average amount given per cow and day is 30 to 40 lbs. together with a little lucerne hay and straw. It suits young cattle and sheep equally well.

For a sheep the day's ration is about 2 lbs. Some farmers feed ensilage to horses also, but in this case care must be taken, as it is liable to upset their digestion.

The American silos are built over ground; they are mostly cylindrical in shape (tub silo) and are made of wood, steel plates, brickwork or beton, and are roofed over.

A silo of 13 to 16 ft. in diameter and 26 to 33 ft. in height costs from £160 to £200.

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(1) See F. H. STORER, *Agriculture*, Vol. I, ch. 14, p. 388, quoted by Funk and Wagnalls, Standard Dictionary of the English Language. London.

(2) See *B*. Jan. and Feb. 1912, Nos. 191 and 391. (*Ed.*).

In the United States green corn (maize) is used for ensilage. It is cut when the grains are still soft and the lower leaves are beginning to turn yellow, and after being chopped fine (each piece about $^3/_4$ in. or 1 $^1/_4$ in. long) it is hoisted by an elevator in to the silo. The corn (maize) should not be too young.

The tub silo was introduced into Victoria (Australia) about fourteen years ago, and by Government aid is within the reach of all farmers.

The all-steel portable silo, known as the Russell, is advisable where white ants are prevalent, where there is danger from bush fires, or where the farmer is on leased property. It is fire-and ant-proof, and it can be easily dismantled and rebuilt.

818 MORGEN, A. **Specific Influence of Fodder on the Production of Milk.** (1). (Ueber die spezifischen Wirkungen der Futtermittel auf die Milchproduction). — *Die landwirtschaftlichen Versuchs-stationen,* Band LXXVII, Heft I u. II, pp. 17-31. Berlin, 1912.

Germany

It is well known that food has an influence on the quantity of milk secreted as well as upon the percentage and chemical composition of its fat, but the causes of such influence are not yet known. Some attribute them to the chemical composition of the food, others to the presence of certain stimulating substances (Reiz stoffe). The author says that as these substances are contained to a very limited extent in fodders, their influence is not due to their value as food but as stimulants of the nervous system.

In some experiments made, with this object in view, on goats and ewes, the Author and his collaborators gave these animals alternatively various proteids, hydrocarbons and fats all of them almost perfectly pure, so as not to contain any stimulating principle. Then by adding very small quantities of some stimulant (fennel, hay extract, molasses, common salt, etc.), an immediate increase in the quantity of milk was obtained, often accompanied by an increase in the fat content.

On the other hand, it appears that the fat content of the food does affect, to a certain degree, the chemical and physical properties of the fat contained in milk, though there are exceptions also. But as even some fodders poor in fat, such as straw and mangels do not prevent the production of fat in milk, it must be supposed that in these cases the lack of fat in the food causes the utilisation of the fat of the animal's body to take place. The fat of the milk is then distinguished by specific characters.

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(1) See below, Nos. 817, 818; also *B.* Jan. 1912, No. 150. (*Ed.*).

In order to investigate this matter, the author conducted some experiments on three goats and two ewes. He fed them during three periods with food containing very little fat, and during the second period substituted mangels for some other fodder; he thus obtained always the same quantity of fat in the milk. This would seem to prove that in consequence of the permanent deficiency of fat in the foods (notwithstanding the changes made in their composition) the fat in the tissues of the animals was utilised to form the fat contained in the milk.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

814

Regulations governing the Certification of Recognized Breeds and Purebred Animals. — *U. S. Dept. of Agriculture, Bureau of Animal Industry, Order* 186. Washington, 1912.

United States

Under the title of " B. A. I. Order 186 " the United States Department of Agriculture has issued regulations governing the certification of recognized breeds and purebred animals imported into the United States for breeding purposes; this order comes under the act of August 5, 1909, allowing free importation of livestock for breeding purposes under certain conditions.

The new order, which came into force on February 1, 1912, authorizes the Bureau of Animal Industry to issue certificates of pure breeding. To obtain such certificates, importers must send in the following information :

1. Number of animals to be imported, breed, sex, port of shipment and of entry, name of vessel by which shipped, and probable date of arrival.

2. A certificate from the vendor must be furnished, giving the name and number of each animal, date of sale, place of purchase, and name and address (in United States) of purchaser. Certificates from foreign books of record may be used.

3. A certificate from the custodian of a foreign book of record is required for each animal, to show that the animal is duly entered in it. There are the following recognized books of record

across the seas: horses, 10; cattle, 15; sheep, 14; hogs, 4; dogs, 6; cats, 1.

The certificate of pure breeding will not be issued until the descriptions of the animals, taken by an inspector of the Bureau of Animal Industry at the port of entry, are received at the department in Washington.

Before additional breeds are added to this order, a complete set of the published volumes of the book of record, with the rules affecting the registration of animals, must be submitted to the department. The department will then consider the case on its merits.

Custodians of books of record for certified breeds are requested to send new volumes as soon as published to the Chief of the Bureau of Animal Industry, in care of the United States Despatch Agent, 2 Rector Street, New York, N. Y., U. S. A.

815 **Report of the Director of Agriculture for the Fiscal Year ending June 30, 1911. Animal Husbandry.** — *The Philippine Agricultural Review*, Vol. V, No. 1, pp. 19-23. Manila, January 1912.

The Division of Animal Husbandry was created in 1910 as a branch of the Philippine Bureau of Agriculture.

Its work includes the supervision of Bureau stock farms, public breeding work in the provinces, the purchase and sale of live stock, and animal feeding tests and breeding experiments. **Philippines**

At present the Bureau has three stock farms, at Alabang, Trinidad and La Carlota.

Horses are bred with a view to improving the native ponies, which are small and have certain defects in conformation, but the good quality of their limbs, their constitution, endurance and adaptability to adverse conditions more than compensate their defects. Though the ideal method of improving the native breed is by careful selection, feeding, etc., yet it has been decided, in order to satisfy the demand for immediate improvement, to introduce Arab stallions and to cross them with the native mares.

The cattle is represented by animals of the Nellore and Angus breeds and their crosses as well as by crosses of Hereford and Galloway with the native breeds. The Nellore breed, being well acclimatized to the tropics, is considered the best for the improvement of native cattle.

Four herds of goats are maintained by the Bureau; of these one is composed of Maltese, one of Spanish; and one of native goats, which are crossed with a pure-bred Spanish male.

As yet, however, they are but little appreciated, as the natives are not, as a rule, milk consumers.

The production of good breeding pigs, on the contrary, is of great importance. Berkshires have been introduced and have proved to be of exceptional value for improving the native breed.

It is intended, with time, to maintain a public breeding station in every province. At these stations should be kept stallions, bulls, billies and boars, the services of which should be available to the public free of charge.

HORSES.

ROMMEL, GEORGE M. **The Army Remount Problem.** — *U. S. Department of Agriculture: Bureau of Animal Industry. Circular* 186. Washington, 1911. **816**

United States

Prior to and during the Civil War the horses of the United States were almost entirely of the light type—warm-blooded. But at the close of the war a rapid and constantly increasing importation of draft horses from Europe began. In the corn belt and in the irrigated sections of the West this type of horse is being adopted more and more by farmers as better suited to their needs, and further where a team of drivers used to be kept an automobile is now usually to be seen.

The present importance of the heavy type is obvious from the following table, which shows the number of purebred stallions of draft and light type, and ponies standing in 11 States, and an estimate of the purebred horses in New York, with the percentage of each type.

Draft horses are thus largely in excess of warm-blooded ones, and the army remount problem has had to be considered. The matter was brought before Congress in 1907, and in 1908-9 two abandoned military posts, Fort Reno, Okla., and Fort Keogh, Mont., were turned into remount depôts. In the present year land is to be purchased for a third depôt in Virginia at Front Royal (Blue Ridge). Each depôt has its own remount district and is under the management of an officer. According to the old system, horses of about the age of five years were purchased from wholesale dealers, and sent straight to the army, whereas now they are bought

STATES	Light		Draft		Pony		Total
	Number	Per cent	Number	Per cent	Number	Per cent	Number
Illinois	1 608	31.70	3 408	67.19	56	1.10	5 072
Iowa	1 121	17.92	5 116	81.78	19	0.30	6 256
Kansas	701	27.02	1 884	72.63	9	0.35	2 594
Minnesota	252	17.51	1 184	82.28	3	0.21	1 439
Montana	175	38.46	280	61.54	—	—	455
Nebraska	204	18.66	887	81.15	2	0.18	1 093
New York (1) . .	865	57.59	361	24.03	276	18.38	1 502
North Dakota . .	114	11.39	886	88.51	1	0.10	1 001
Pennsylvania . .	367	45.70	434	54.05	2	0.25	803
South Dakota . .	165	13.43	1 062	86.41	2	0.16	1 229
Utah	56	19.93	225	80.07	—	—	281
Wisconsin	436	32.68	894	67.02	4	0.30	1 334
Total . . .	6 064	26.30	16 621	72.08	374	1.62	23 059

(1) A partial list. New York has no stallion registration law. The figures are from Bull. 17, New York Department of Agriculture, and include both sexes.

from farmers in the remount districts chiefly at the age of three years, though a large number of 2-year-olds are also selected. They are taken to the depôt and carefully brought up and trained for cavalry and artillery purposes. The average price for young horses of this kind was in 1911 $ 137.50, which is somewhat more than farmers usually receive for such horses.

For the encouragement of breeding horses for the Army, a plan has been drawn up to divide the country into four breeding districts, and to purchase 100 stallions to stand for service free of charge for approved sound mares, the mare owner to give in return an option on the resulting foal during the year it is three years of age.

CATTLE.

817 **Buschmann, A. Raw Potatoes as Food for Milch-Cows.** (Versuche über die Bedeutung der rohen Kartoffeln als Futter für Milchvieh).—*Illustricrte Landwirtschaftliche Zeitung*, 32. Jahrg., No. 20, pp. 183-185. Berlin, 9. März 1912.

Russia

Potatoes, which thrive better in northern countries than mangels, could advantageously replace them in the feed of milch cows, but they are believed to exert an unfavourable action on the production of milk when they are fed raw. To ascertain what foundation there is for this belief, the Author made a series of experiments on three lots of eight cows each, all of about the same live weight and milk production. The test extended over three periods of 20 days each, during which the cows were fed as follows:

Period A: All three lots received besides the usual basal ration fodder, 30 lbs. of mangels.

Period B: Usual fodder the same for all the cows besides which the following were given:

to lot 1 : 30 lbs. mangels,
» » 2 : 8 $^{3}/_{4}$ » potatoes,
» » 3 : 4 $^{1}/_{2}$ » mangels,

and concentrated food with the starch-value of 26 $^{1}/_{2}$ lbs. of mangels.

Period C: The same as in period A.

According to the tables of results furnished by the Author the yield of milk and its content of butter fat varied very little, from which it may be inferred that raw potatoes are as useful as mangels in the feed of milch cows, at least when not given in excessive quantities.

In a second series of experiments potatoes were compared with linseed and sunflower cake.

It was then seen that potatoes increase the quantity of milk, whilst the above cakes seem to produce a higher fat content. But the differences were so small that they had no practical importance.

818 **Influence of Palm-nut Cake on Milk.** (Untersuchungen über die Wirkung der Palmkernkuchen auf die Milchproduction). — *Berichte über Landwirtschaft vom Reichsamt des Innern*, Heft 24. Berlin, 1911.

Germany

The "Deutscher Landwirtschaftsrat" decided to investigate the question whether palm-nut cake has a special influence on milk by increasing the total yield. A plan of experiments was submitted to nine stations in different parts of Germany: in each case two groups of ten cows in the first six months of lactation and as even as possible in every respect were to be chosen. The whole experiment was divided into six periods — three preparatory ones of five to seven days, then three principal ones of twenty days, making a total of seventy-five days. During this period the milk yield of each cow and the fat-percentage were determined after each milking (1).

The food consisted of a basal ration and a supplementary ration, calculated according to Kellner's rules with reference to the live weight and milk-yield of each cow. The composition of the basal ration was not fixed, so that each station prepared one suitable to local conditions. The Bonn-Poppelsdorf station, for instance, gave the following ration per day per 1000 lbs. live weight:

Lucerne hay . . .	9 lbs.	Linseed cake . . .	2 lbs.
Mangels	30 »	Wheat bran	2 »
Beet-slices , . . .	5 »	Earth nut cake . .	1 lb.

The Weihenstephan station gave per day to a cow of 1400 lbs. weight.

Hay	29 ½ lbs.
Mangels	13 lbs

The supplementary ration for the first and third periods was a mixture of maize and earth-nut cake, and for the second period palm-nut cake equal in "starch value" to that of the supplementary ration of the first and third periods. The amount of this ration was also not the same at all the stations, varying from 4 lbs. to 6 lbs. per day per 1000 lbs live-weight.

In the carrying out of the experiment there were also some differences between the different stations: some had two groups of

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(1) All the figures obtained are given in the original article. (*Ed.*).

STATION	No. of Cows	Breed	Influence of palm-nut cake on:		
			fat content of milk	quantity of milk	composition of fat
Bonn-Poppelsdorf	20	Oldenburg	increase of 9 % of original content	very slight decrease	distinct alteration
Danzig . . .	20	Dutch, black and white	increase of 45.9 gr. (1 3/4 oz.) per cow per day	very slight increase	distinct alteration
Greifswald .	24	id.	increase	very slight decrease	distinct alteration
Hamburg .	18	Friesland	increase	no increase	alteration
Jena (1) . .	20	Simmental	increase in 2 cows; doubtful in 7; no change in 1	—	alteration
Oldenburg .	15	?	increase from 3.23 % to 3.62 %	very slight increase	distinct alteration
Rostock . .	24	Dutch, black and white	increase from 3.06 % to 3.47 %	no increase	alteration
Triesdorf . .	20	various	increase, but much individual variation	slight increase	distinct alteration
Weihenstephan . . .	20	Simmental	favourable influence, individual variation	decrease, owing to drying-off and poorhay	apparent alteration

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(1) Owing to lack of good hay, too much concentrateds was given causing some cases of indigestion.

twelve cows instead of ten; two others, owing to illness or drying-off of some animals, finished up with only eighteen and fifteen cows under observation. Four stations only changed the supplementary ration for one group, keeping the other group on the same ration all the time as controls (*group system*); in the other five the supplementary ration of all the cows was changed for each period (*period system*). Further, the Weihenstephan station fed the palm-nut cake in the first and third instead of in the second period. Some of the stations also continued the experiments longer.

The results are given in the accompanying table.

The stations of Bonn-Poppelsdorf and Rostock noted slight increases of live-weight on the palm-nut cake ration; these are however given with reserve, and the Greifswald station remarks that there is great difficulty in determining slight differences in live-weight: variations up to 33 lbs. in 24 hours were noted.

Conclusions.

1. The addition of palm-nut cake to the food of milch cows generally gives a slight increase in the fat-content of the milk; this increase varies with different cows.
2 The milk-yield is hardly increased.
3. The chemical composition of the butter-fat undergoes considerable alteration: it thus appears that part of the oil from the palm-nut cake passes unaltered into the fat of the milk.

PIGS.

819 VÖLTZ, WILHELM. **Feeding Experiments with Dried Yeast, Potatoes and Barley.** (Fütterungsversuche mit Trockenhefe, Kartoffeln und Gerste). — *Landwirtschaftliche Jahrbücher*, XLII. Band, Heft 1, pp. 118-179. Berlin, 1912.

Germany

The experiments hitherto made on the practical use of dried beer yeast as fodder and on its influence on the quality of the meat produced, are not numerous.

The author took nine young pigs, from the same litter, of the local breed improved by crossing, and fed them from the age of 42 days until they were slaughtered, with a mixture of dry yeast, barley and potatoes, to which were added a certain quantity of salt and some calcium phosphate. Every week their weights were taken, and they were weighed after being killed. They were born on the 5th of August 1910. Four weeks after their birth they were fed some dry yeast and potatoes. After weaning they had no more milk nor dairy produce. The cooked potatoes were mashed while still warm and mixed with dry yeast and barley groats. The rations of yeast were at first 50 grams per head per day and they increased gradually to 600 grams. The initial amount of barley given was 55 gr. per head per day, and it was increased gradually to 100 gr. Potatoes were fed *ad lib*. During the day they could take exercise in a court yard, at night they were kept in a sty. On the 7th of November they were divided into two lots: group I, of 5 pigs, remained throughout the winter in the open; group II, of 4 pigs, was always kept in the sty. Both groups were fed alike. There was no disease, and the animals enjoyed always a good appetite. On the 25th of April the animals were killed at the Berlin slaughter-house, after having been photographed and measured.

All the data collected during the experiment are given very exactly in several tables in the paper. The most important are here tabulated:

LOT	Average live weight per animal			Average dead weight per animal		Food per head			The production of 1 lb. live weight cost (1)
	At birth	At end of experiment		absolute	In % of live weight	Yeast	Barley	Potatoes	
		at the station	at the slaughter house						
	lb.	lb	lb.	lb.	%	lb.	lb.	lb.	*d*
I	3.26	284.2	268.8	216.5	80.52	228.8	50.4	2 754 4	3 12
II	3 26	282.9	271.7	216.8	79.82	224.4	51.7	2299.0	2.75

(1) Dry yeast cost 7*s* 8.90*d* per cwt.
Barley » 7*s* 3.10*d* »
Potatoes » 1*s* 11.22*d* »

The flesh of both groups was, according to experts, very good. There was little difference in live or dead weight, and in the shape of the body or in the development of the interior organs, between the two groups. The group kept in the sty had somewhat finer hair and the foot-joints were not quite so strong as in those pigs kept in the open. But in Group II the cost of producing 1 lb.

live weight was 0.37*d* less than in Group I, which in winter required more food.

Nevertheless the author does not recommend keeping pigs always in their sties, as he believes it makes them more delicate and liable to disease.

Keeping accounts of the amount of food consumed during the various months, it appears that the production of 1 lb. live weight during the first months costs only 1.39 to 1.44*d*.; afterwards it becomes gradually higher, reaching, in the last two months, 4.27*d*.

From the above experiments the author draws the following conclusions:

1. Dry yeast together with potatoes and barley forms a good and cheap food for pigs.

2. The fattening of pigs ceases to te remunerative after the pigs have attained a weight of 220 lb., because they lay on always less flesh in proportion to the food consumed.

880 HANSEN, Prof. **Experiments on Fattening Pigs with "Fattingers Körnerblutfutter".** (Schweine-Mästungsversuche mit Fattingers Körnerblutfutter). — *Deutsche Landwirtschaftliche Tierzucht*, 16. Jahrgang, Nr. 9 and 10, pp. 97-100 and 113-119. Hannover, 1. and 8. März 1912.

Germany

The blood from the slaughter-houses at Vienna and Berlin is made into a concentrated food by mixing 50 parts with 90 parts of grain meal (feeding meal) and drying the mixture by steam. The product is sold as "Fattingers Körnerblutmehl".

Prof. Hansen has compared this mixture as pig-food with other feeding-stuffs. His experiments were made in 1911 at the Experimental Farm of Königsberg University, and lasted 121 and 122 days respectively; they were made on two lots of Improved German pigs, one lot of 19 divided into two groups, the other lot of 25 divided into three groups.

In the first experiment the daily ration per 100 lbs. live-weight was 1 ¾ to 2 ½ lbs. of potato-chips, 1 to 1 ½ lbs. of crushed barley, besides which group I got 5 ½ to 7 ¼ oz. of meat and fish meal, while group II got 16 ¾ to 25 ½ oz. of the corn-blood meal.

In the second experiment potato chips were only given in the first seven weeks and were then replaced by whole potatoes of the same "starch value". The rations of groups I and II were much like those in the first experiment, while group III had only barley and the corn-blood meal.

The proportions of the ingredients underwent some slight alterations during the experiments, but the "starch value" was kept the same.

The following are the most important figures from the tables of the results:

		Average daily increase of live-weight per head		Percentage dead-weight to live-weight	Cost of producing 1 lb. of live-weight
		lb.	oz.		d.
Expt. *A*	Group I	1	4 ½	83	3
	Group II	1	4	80.3	3 ½
Expt. *B*	Group I	1	8 ½	84.3	2 ½
	Group II	1	11	82.1	3 ¼
	Group III	1	6	81.1	3 ½

The meat of these pigs was judged by experts to be of first quality; in one case there was a slight superiority in that of the corn-blood meal group. From this point of view and the satisfactory increase of live-weight obtained, the corn-blood meal might be recommended; but its high price (9*s* to 10*s* per cwt.) does not allow of producing meat as cheaply as with potatoes, barley and meat and fish meal. If the price were 18*d* per cwt. less it might be recommended to pig fatteners, especially as it would mean the use of a good deal of blood at present wasted.

MURRAY, JAMES. **Experiment in Fattening Hogs.** *Experimental Farms. Reports for the Year ending March 31, 1911*; pp. 384-386. Ottawa, 1911. **881**

To determine the feeding value of digester tankage (1), a lot of 28 young pigs was divided into five lots and fed different rations during a period of 86 days. **Canada**

In the following table details are given, as well as the more important results.

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(1) See note to No. 811, above. (*Ed.*)

Lot		I	II	III	IV	V
Number of pigs		5	5	7	6	5
Food given		Chopped barley, roots	Barley and tankage, roots	Mixed chop: peas oats, barley 1:1:1 roots	Mixed grain and tankage, roots	Mixed chop and tankage, roots
		lb.	lb.	lb.	lb.	lb.
Average weight at start . .		88.—	60.2	71.—	67.5	110.3
« « « end . .		170.4	151.8	144.3	142.—	217.2
« gain per pig per day		0.9	1.04	0.85	0.86	1.23
Amount of food per 1 lb. gain live weight . .	Meal . .	3.1	2.9	3.2	3.35	3.12
	Tankage .	—	0.39	—	0.48	0.33
	Roots . .	0.42	0.39	0.67	0.65	0.52
		cents	cents	cents	cents	cents
Cost for 1 lb. gain, live weight		3.19	3.72	3.32	4.1	4.4

Satisfactory gains were made by all the lots. The following prices were charged for feed: Grain.—$1 per 100 lb. Digester tankage.—$1.50 per 100 lb. Roots.—5*c.* per bushel of 60 lb. In thrift and general appearance there was no noticeable difference in the lots under experiment. This is probably accounted for by all the pigs being fed liberally on roots at noon every day throughout the period.

GOATS.

882 ARDOUIN-DUMAZET. **Goats in the South-East of France.** (La Chèvre dans le Sud-Est). — *Journal d'Agriculture Pratique*, 76e Année, Tome 1, No. 11, pp. 232-235. Paris, 14 Mars 1912.

France

The Grenoble glove industry offers an important market for kid skins, the finest of which are from very young kids that have not yet grazed. In order to avoid the skins being damaged by thorns, etc., the young animals are stall fed, and after they are slaughtered they must be flayed with care so as not to make holes in the skins or stain them with blood. A kid skin is worth 3 to 4 francs (2*s.* 4*d.* to 3*s.* 2*d.*), to which must be added the value of the flesh, which is highly appreciated in the South-East of France and consumed in large quantities both fresh and salted.

Thanks to the glove industry, which is far from finding in France the number of skins it requires, goats are bred in the South-East of that country in considerable and increasing numbers, Besides the kids, goat's milk, from which cheeses are made, is a source of revenue for farmers. *Tome* of Saint-Marcellin, *Picodon*, *Archiane* and *Rigotte* of Condrieu are highly reputed cheeses made with goat's milk, that fetch 1.80 to 3 fr. per kg. (7 3/4 *d.* to 13 *d.* per lb.).

In order to develop still further this industry, which yields a gross revenue of 70 to 115 fr. (£2.15*s.* 6*d.* to £4.11 *s.* 3*d.*) per goat per year, the author recommends centralizing the making of these cheeses, or at least the trade in them, besides improving the breed of goats by means of selection.

POULTRY.

PALMER, G. A. **Size and Laying Powers. Lessons from the Laying Competitions.** — *The Farmer and Stockbreeder*, Vol. XXV, No. 1174, pp. 614-615. London, March 25, 1912. **828**

Great Britain

Some years ago the author formulated a theory of energy in small races, according to which the small hens were the best layers. In support of his theory he gives the results of some recent laying competitions in England, and he shows that with few exceptions the lighter birds score highest in the number of eggs laid, whilst the heaviest are almost always the lowest. It would of course be an exaggeration to consider every small hen as a good layer, as there are always exceptions. Nevertheless these researches show the direction to be followed, and that it is not the heavy hen that lays most eggs.

A hen after four months laying and perfect feeding may be considered to be about the full weight that the bird will attain. From this it appears that best laying Buff Orpingtons should not exceed five pounds in weight when full grown; that White Wyandottes should be five to five and a half; Buff Rocks the same; White Leghorns 3 lb. 10 oz. to 3 lb. 12 oz.; and Rhode Island Reds 4 ½ to 5 lb.

824 LAURIE, D. F. **The Fertility of Hens' Eggs** (1). — *The Journal of the Department of Agriculture of South Australia*, Vol. XV, No. 7, p. 723. Adelaide, February 1912.

South Australia

At the Roseworthy Poultry Station the author conducted some experiments on the fertility of hens'eggs. The male bird after having been some time with the hens was removed, and each day's eggs were dated as gathered. These were placed in lots of about 30 (about 10 per day) in incubators of small capacity. It was found that all the eggs laid during the first three days after the removal of the male bird were fertile, after which the proportion of fertile eggs began to diminish; on the ninth day it was 80 %, on the eleventh 50 %, on the sixteenth 10 %. After the seventeenth day all the eggs were infertile.

825 **Alarum-Signal Apparatus for Incubators.** (Alarm-Signal-Apparat für den Brutapparat). *Landwirtschaftliche Umschau*, 4 Jahrg., Nr. 13; pp. 289-290. Magdeburg, 29. März 1912.

Germany

In every incubator there is the danger that the heat regulating apparatus might get out of order and allow the temperature to rise or to fall too much and thus spoil the whole brood. To avoid this an electrical alarum has been devised which acts as soon as the temperature varies beyond certain limits. The apparatus consists of a Bourdon capsule fixed vertically in a rectangular iron frame, and which transmits the motion caused by its variations of volume (due to different temperatures) to a lever which in its turn completes an electrical circuit in connexion with an alarum bell.

The lower extremity of the spindle of the capsule is let into an adjusting screw in the iron frame. Between the top of the Bourdon and the frame a space of 0.196 inch (measured at a temperature of 40° C.) is left. On the Bourdon a pin is loosely fixed; it passes through a hole in the frame, and acts at right angles on a lever consisting of a thin brass pipe fixed at one extremity on the top of the frame. The free extremity of the lever multiplies fortyfold the motion of the pin; it is situated between the jaws of a U-shaped strip of brass soldered to an electrical wire. The other wire of the circuit is inserted in the hollow lever and projects a little beyond it. The free end of the wire and the points of the jaws are tipped with silver to increase their conductivity.

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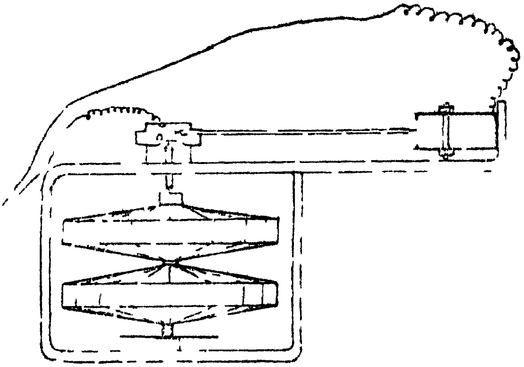
(1) See similar experiments in *B.* July 1911, Nos. 2227 to 2229. (*Ed.*).

The apparatus is placed among the eggs and by means of the adjusting screw the free end of the lever is situated half way between the above-mentioned jaws.

Any change of temperature causes the pin to rise or to sink and the lever to close the electrical circuit, thus starting the alarum bell.

The annexed figure shows the arrangement of the different parts of the apparatus.



FISH.

V. Scheidlin-Ustrow, C. **Schröder's System for running off Overflow from Fish-Ponds.** (Der Schröder'sche Kommunikations-Teichständer). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, Nr. 21, pp. 199-200. Berlin, 13. März 1912. 826

The overflow water from fish-ponds is generally run off down a large vertical tube, the level being thus prevented from rising above the top of the tube. This method has the disadvantage of running off the part of the water which is richest in nutritive material and air, and has received most sun, that is the superficial layer; this is consequently lost to the fish, while the water at the bottom, which is often stagnant and bad, sometimes containing marsh gas, is retained. **Germany**

To get over this difficulty, Hr. Schröder uses a special outlet pipe. This has its opening above the surface of the water, and is divided in two by a vertical partition, which reaches to the water-level; one half of this pipe is connected with the water by a horizontal tube along the bottom of the pond, while the other connects with a horizontal outlet tube. In this way, a rise of water in the pond causes a flow over the top of the partition, not of surface water, but of bottom water.

827 KÖNIG, F., THIENEMANN, A. and LIMPRICH, R. **Influence of Fat Food on the Eating Qualities of Carp.** (Der Einfluss des Futterfettes auf das Körperfett der Karpfen). — *Zeitschrift für Untersuchung der Nahrungs- u. Genussmittel*, 23. Band, No. 5. pp. 177-198. Münter i. W., 1. März 1912.

Germany

The authors proposed to determine whether artificial feeding had an influence on the fat of carp. In the spring of 1909, they placed in each of five small ponds, 5 one-year-old carp and 5 three-year-old ones. During the summer the carp of each pond received different foods (lupins, maize, sesame cake, ground-nut cake, and barley with meat-meal).

The quantity of each food used during the summer was 125 kilos (275 lb). In autumn the carp were fished and killed, and their fat examined as to its chemical and physical properties.

This experiment, but with a less abundant supply of food and with one-year and two-year- old carp, was repeated in 1910. The fat of a certain number of carp which had been kept without artificial food was also examined. Besides, experts were called upon to judge the flavour of one fish from each group.

The following is a summary ot the results:

1) An abundant supply of food produces a strong proportion of fat in carp.

2) The fat contained in the food has an undoubted influence, and in proportion to its abundance in the food, on the composition of carp fat.

3) The presence of phytosterin in the fat of carp has not been proved.

4) The taste of carp undergoes, in consequence of the various foods, such changes as to become in some cases unfit for food.

5) No artificial feeding produces a quality of carp as good as that obtained with natural food.

The carp breeder must therefore endeavour to increase this kind of food.

828

BODIN, M. E. **Keeping Oysters in Filtered Artificial Sea-Water.** (Stabulation des huîtres dans de l'eau de mer artificielle filtrée). — *Comptes rendus de l'Académie des Sciences,* Tome, 154, No. 7, pp. 446-447. Paris, 12 Février 1912.

France

The writer quotes trials made by M. Fabre-Domergue in keeping oysters in tanks through which filtered sea-water circulated. After eight days of this treatment the oysters did not lose weight or plumpness or vitality; and after double the time they had still undergone no appreciable deterioration.

The writer himself made experiments with artificial sea-water, prepared from salt-marsh salts and sodium chloride, and having a composition nearly the same as that of real sea-water, but of slightly less density (1.022). The apparatus was prepared according to M. Fabre-Domergue's plan; it has a capacity of about 8 3/4 cu. ft.; the overflow water is pumped onto a sand filter not submerged, from which it passes to a reserve tank, and thence back to the oyster-tank; the flow is so arranged that the water in the tank shall be completely renewed every hour and a half during twelve out of the twenty-four hours.

The observations were made on 500 Marennes and Cancale oysters, divided into groups of 100, each of which was kept a different length of time.

The following observations were made:

1) Kept for eight days under the conditions described above, the oysters were fully alive and did not lose their good appearance. The same result was obtained with another lot of 100 kept 15 days and a third lot for a month.

2) In every case the weight of the lots of oysters showed only slight alterations; in three cases out of four there was an increase.

3) Oysters kept for eight days showed no change in taste, but those kept for long periods changed markedly, tasting much less salt than ordinary fresh ones.

These experiments show that oyters may well be kept in artificial sea-water; as this can be prepared anywhere, they may be thus kept at any distance from the coast.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

820 FORESTI, A. and VITTORANGELI, R. **The Application of Electricity to Agricultural Purposes in the Province of Reggio-Emilia.** (Le applicazioni agricole della energia elettrica nella Provincia di Reggio-Emilia). — *Pubblicazione della Cattedra Ambulante d'Agricoltura di Reggio-Emilia, 1912.*

Italy

It is easy to apply electricity to the systems of mechanical ploughing, which are bering more used every day. In the province of Reggio-Emilia, mechanical ploughing is preferred to animal traction, even where the owners of the machines ask 100 lire per ha. (32*s* per acre), and this for two chief reasons: 1) The technical advantages inherent in mechanical ploughing. 2) The advantages which stock-breeding indirectly derives from mechanical ploughing.

This being the case, the writers have considered in this objective research: the comparative cost of electric ploughing and that of the other types of engine most used. In order that this comparison may agree as nearly as possible with the actual data, they first take into consideration the energy at the disposal of the province of Reggio-Emilia and the price at which it is available for agricultural purposes; they also discuss its use, not theoretically, and within circumscribed limits, but on the large scale actually embarked upon by the Agricultural Cooperative Society of S. Vittoria on its farm in the commune of Gualtieri. Near this farm passes a high tension line of 40 000 volts, and a medium tension line of 10 000 volts. The price to which the Novara Electric Energy Co. has agreed is 0.11 l. (1.04*d*) per KW hour, *i.e* 0.0809 l. (0.7702*d*) per HP hour, with a minimum guaranteed price per HP of 100 l. (£4). The limit of use for each 100 l. (£4) is therefore: (100 ÷ 0.0809) 1236 hours. Above 1 236 hours, the cost of one HP hour is 0.0809 l. (0.7702 *d*). This contract, which is the best at present obtainable, is perhaps rather mixed in form, but it is also possible to obtain extra unrestricted energy for consumption for 130 l. (£5 4*s*) and 120 l. (£4 16*s*) per HP-hour from the Novara Company, and the Emilia Company at Parma, respectively.

A plan of the estate of S. Vittoria shows the extent of the lines which will run across it. The line of 10 000 volts extends to the houses so that eventually the energy may be as completely utilized as is possible.

The estate covers about 680 ha. (1680 acres), of which 300 are regularly ploughed for wheat or are laid down to lucerne, or used for tomatoes, melons, and rice.

The amount of work done by tackle working a double-furrow balance plough with a force to be stated later, is reckoned at 1.5 ha. (3.7 acres) per drum per 10 hours. This estimated amount is however very little. The ploughing was distributed as follows:

July : 22 days, 16 hours = 352 hours
August : 24 » 16 » = 384 »
September : 15 » 12 » = 80 »
October : 10 » 8 » = 80 »
Total : 71 days 996 hours

Or in round numbers, 1 000 hours, which means 100 average days. Work done by two drums in 10 hours—3 ha. (7 ½ acres) ; 3 ha. × 100 days = 300 ha. (740 acres).

With regard to the necessary energy for ploughing, the writers have based their statements on the data obtained by Sig. Mantica, which, besides being reliable themselves, agree with those recently obtained at Parma on heavy clay soil, worked to a depth of 40 cm. (16 in.) or more. Mantica found that for heavy clay soil, ploughing to a depth of 20 to 30 cm. (8 to 12 ins.) requires 65 KW-hrs. per ha. (26 KW per ac.), and to a depth of 30 to 40 cm. (12 to 16 in.) requires 89 KW-hrs. per ha. (36 KW per ac.).

He gives the following maxima of energy necessary for plonghing to different depths in clay soils.

	Depth	KW	HP	HP mean effective
I	8 in.	18-20	25-27	21.5
II	10 »	20-23	27-32	25
III	12 »	24-27	33-37	30.5
IV	14 »	29-31	40-43	36.5
V	16 »	31-35	43-48	40
VI	16 »	31-40	43-54	44

The figures in VI refer to the ploughing of neglected plain with deep roots and very hard soil.

In support of these figures, the writers cite ploughing done on the Treves estates at Legnago by Sig. Malaguti for the Thomson Houston Co.; figures furnished by Harald Wallem, and by Rieck of Bromberg, etc. For this reason, they have adopted in the following calculation the maximum of 96 HP with motors of 50 HP.

Calculation on the farm.

Ploughing 300 ha. (740 acres) with Various Motors.

Electric Motors.

Installation Capital:

	£ s d
8 km. (about 5 miles) of line of 10 000 volts at 1 800 l. per km. (£115 per mile) . . .	571- 6-5
2 groups of transforming motors, each of 50 HP, with accessories	396-16-6
2 drums with ploughs, anchors, cables, etc. .	674-12-1
Total	£ 1642-15-0

Working expenses:

	£ s d
Cost of use (1) of the line: 13 % of the installation capital	74- 5-9
Cost of use of transformers, motors and accessories: 15 % of installation capital . .	59-10-6
Cost of use of drums, ploughs, cables, etc: 20 % of installation capital	134-18-5
Cost of electric energy	380-19-0
Labour for operating motors and transformers: 100 days × 2 apparatus at 5 l. (about 4*s*)	39-13-8
Labour for the drums and ploughs: 200 days × 4 men × 4 l. (about 3*s* 2*d*)	126-19-8
Oil and rags for the motors	7-18-9
Oil for drums and cables	5-19-0
Insurance of men	3-19-4
Superintendence, ...	23-16-2
Total	£858- 0-4

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(1) Cost of use = interest + total depreciation + maintenance.

Remainder of electric energy after utilization for ploughing :

The energy placed at disposal at the cost of 9 600 l. (£381) is 118 656 HP-hours (9 600 l. ÷ 0.0809 cost of one HP-hour.)	
The force used for ploughing may be considered as follows: KW hours per ha. 100 (per ac. 40). 100 KW hours × 300 ha. (740 acres) KW hours	30 000
Loss by line and by transformation at 10 %	3 000
Energy for working motor to draw back the plough empty : 3 hours for 7 KW (1) and for 100 days	2 100
KW-hours	35 100
= HP-hours	47 736
Energy at disposal for 9 600 l. (£381): HP-hours	118 656
HP-hours used for ploughing	47 736
Remainder HP-hours	70 920

SUPER-HEATED STEAM TRACTION ENGINES.

Installation Capital.

	£ s d
2 engines of 48 HP	1031-14-11
2 drums, ploughs and accessories	674-12- 1
Total	£1706- 7- 0

Working-expenses.

Cost of use of engines at 20 %	206- 7- 0
Cost of use of drums, plonghs and accessories at 20 %	134-18- 5

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(1) The amount of energy used to draw back the plough empty is about 10 % of the power of the motor (10 % of two 50 HP motors = 10 HP = about 7 KW). The motor spends 3 hours out of 10 on this (Mantica).

	£ s *d*
Coal for the engines at work, at 36 720 HP (1) × 2.4 kg. (5.28 lbs) (2) × 0.045 l. (0.43*d*) =	157- 6-10
Coal for the engine while drawing back the plough empty: 5 760 HP (3) × 4 kg. (8.8 lbs.) (the consumption is greater when the machine is not ploughing) × 0.045 l. (0.5*d*) . .	41- 2-10
Labour : 100 days × 12 l. (driver and fireman) × 2 apparatus	95- 4- 9
Carting coal and water (4) 14 l. × 100 days .	55-11- 1
Labour for the drums and ploughs: 200 days × 4 men × 4 l.	126-19- 8
Oil and rags for the engine	13-17- 9
Oil and rags for the drums, cables, etc. . . .	5-19- 0
Insurance of men	3-19- 4
Superitendence	23-16- 2
Total	865- 3- 0

(1) The result as follows:

Supposed consumption according to electric measurements KW-hours	30 000
Deduction of 10 %, since the measurements were taken at the clips and not on the shaft where the energy of engines is calculated.	3 000
KW-hours	27 000

27 000 KW-hours × 1.36 = 36 720 HP-hours.

(2) The consumption of coal exceeds the amount which can be determined theoretically. The combustion experiments (made with new engines, an expert mechanic, and excellent fuel) apply to work with a full normal charge ; but the engines, especially in ploughing, work with an average charge generally much less. In this case, if the alsolute consumption diminishes, the relative consumption, *i.e.* per HP-hour, increases. It should be mentioned that the engines, after repeated removals, require for the same amount of work more fuel, for they are not in perfect working order, owing to the shaking they have undergone.

(3) The expenditure of energy for an unoccupied engine is about 20 % of its power.

20 % of 96 HP (2 locomotives of 48 HP) = 19.2 HP. 19.2 HP × 3 hours × 100 days = 5 760 HP-hours.

(4) Coal to the amount of 42 480 HP at 2.4 kg. (5.2 lbs.) and water to the amount of 42 480 HP at 20 kg. (44 lbs.), about 9 500 qls. (932 tons), *i.e.* per day 95 qls. (9 tons 6 cwt.) has to be fetched; this requires carts with two or four horses and two or four men, according to the distances, the condition of the roads, etc.

GAS ENGINES.

Installation capital:

	£ s d
Two gas engines with automatic motion and apparatus for water circulation	1 309- 10-6
Drums, ploughs, etc.	674-12-0
Total . . .	1 984- 2-6

Working Expenses:

	£ s d
Cost of use of engines at 25 %	327- 7-7
Cost of use of drums, etc., at 20 %	134-18-5
Anthracite for engines at work:	
36 720 HP (*see steam engines*) × 0 75 kg. (1.65 lbs.) × 0.06 l. (.57*d*)	65-11- 5
Anthracite for unoccupied engines:	
5 760 HP (*see steam engines*) × 1 kg. (2.2 lbs.) × 0.06 l. (.57*d*)	13--14-3
Labour 100 days × 12 l. × 2 apparatus . . .	95- 4-9
Carting coal and wates: 14 l. × 100 days . .	55-11-1
Labour for the drums and ploughs: 200 days × 4 men × 4 l.	126-19-8
Oil, insurance, superintendence as for steam engines	47-12-5
Total	866-19-8

N. B. The data given with regard to the consumption of fuel by super-heated steam engines with average load and empty, apply equally to this type of motor. They are the same for carting fuel and water, with slight variations. As to the labour entailed for the motot and gas-generator, it is in no respect less than that needed by steam engines, owing to the sum of work necessary and the delicacy of gas engines. The cost of working is high on account of up-keep and deterioration.

HEAVY-OIL ENGINES.

Cost of installation:

	£ s d
Two engines, etc.	1 309-10- 5
Two drums, etc.	674-12- 1
Total . . .	1 984- 2- 6

Working expenses:

	£ s d
Cost of use of engines at 25 %	327- 7- 7
Cost of use of drums, etc., at 20 %	134-18- 5
Fuel: 36 720 HP (*see steam engines*) × 0.55 kg. (1.2 lb.) × 0.12 l. (1.14 *d.*)	96- 3- 0
Fuel for unoccupied engines: 5 760 HP (*see steam engines*) × 0.08 kg. (.176 lb.) × 0.12 l.	21-18- 1
Labour: 100 days × 8 l. × 2 apparatus. .	63- 9-10
Daily cleaning of motors: 100 days × 2 l. × 2 motors	15-17- 6
Carting water	15-17- 6
Labour for ploughs and drums: 200 days × 4 men × 4 l.	126-19- 8
Lubricants, insurance and superintendence, as for super-heated steam engines	47-12- 5
Total . . .	850- 4- 3

N. B. The same remarks as for gas-engines apply for fuel here. The price was fixed according to the cost of heavy oil at Genoa together with that of the other carting expenses, with regard to the fact that the most expensive fuel is necessary for sure working.

The labour comprised one expert mechanic only; these machines require special knowledge for their direction. The cost of use is raised for the same reasons as in the case of gas motors.

BENZINE MOTORS.

These, though equal in other respects, require more costy fuel; they are therefore not included in the comparative calculations.

The comparison in the cost of the working unit of the different motors applied to ploughing, shows that the results tend to become equal, since the differences which exist must be considered insignificant in comparison with the figures dealt with.

The cost of ploughing is always about 72 l. per ha. (23*s* per acre), but the superiority of electric power (when it is obtained by a reasonable contract) over all other kinds of energy, rests on the remainder which is left over for other agricultural work: 70 920 HP hours, according to the contract of 100 l. (about £ 4) per HP-hour, remain to be disposed of. This energy can be used at great advantage and gratuitously for the following agricultural operations: *a*) raising water in spring, to free the crops from excess of water in very wet springs; *b*) threshing; in using the night hours in summer, and in September and October (for threshing maize and rice) days when the land is too wet for ploughing.

The wirters give the following figures, carefully worked out for threshing, but for water-raising chiefly to show the margin for disposal which remains even after these operations.

Total power at disposal.	HP-hours	118 656
For ploughing	HP-hours	47 736
For threshing:		
45 days of 10-hours = 450 hours at 20 HP	HP-hours	9 000
For raising water:		
20 days of 24 hours = 480 hours at 40 HP	HP-hours	19 200
Total . .	HP-hours	75 936
Remainder . .	HP-hours	42 720

The amount to be disposed of is therefore enormous, in spite of the great deductions already made, and they can be developed indefinitely when the contract is *à forfait*, *i. e.* does not limit the consumption; this, however, is not to be recommended, considering the limited use which is at present made of electric power.

The great future which awaits the employment of electricity in agriculture depends upon the adaptation of agricultural machines to the new systems of working, seeing that every agricultural operation can be accomplished with its aid. In the field, harvesting, compressing hay, harrowing, sowing, carting, pumping for irrigation, projection of light.

In the stable: crushing grain, chopping fodder, milking, heating water, ventilation, lighting.

In the industries of cheese- oil- and wine-making the electric motor is already an indispensable auxiliary to man.

The service lines, or exploitation lines, presuppose mechanical transmission by means of drums driven by transformer-motors attached directly to the lines themselves, or the help of protected moveable cables.

The writers believe, until it has been proved to the contrary, that it is safer to keep to the direct current system. The mechanical transmission, based on the use of anchors, could be facilitated if anchorage were done away with, and the portions to be ploughed were bounded by strong posts fixed in reinforced concrete, which would serve to support the chains. Upon these the pulleys would work by a very simple arrangement, which would save time and labour.

The resulting work would be greater and the expense per acre diminished. Further, the less important agricultural operations, harrowing, mowing, etc., for which the complexity of movement required from the drums is disproportionate to the work itself, would be accomplished by new apparatus, which is more practical and more rapid and well devised and adapted for electrical purposes.

The extent of the line for the estate of S. Vittoria is 12 m. per ha. (16 ft. per acre), and the line extends to the houses and cheese-factories.

The cost of installation was 22 l. per ha. (about 7*s* 3*d* per acre). As to the system with the posts, these, calculated at a distance of 20 metres (65 ft.) along the displacement lines of the pulleys, which are perpendicular to the lines of work, and with a working distance of 200 m. (656 ft.) (the tracks between the fields can be crossed by balance ploughs), are about three to the hectare (one per acre) and cost about 25 l. per ha. (8*s* per acre). The cost of about 50 l. per ha. (16*s* per acre) represents but a small capital outlay, when the certain and immediate advantage is taken into account, especially in comparison with the numerous outlays of 1000 l. and more, for buildings and other expenses incurred in portioning out, drainage, etc.

Their objective economic end having been attained, the writers conclude this paper with some remarks which open out new horizons to agricultural industry and to forms of associations.

They point out, that at the International Exhibition of Agricultural Machinery at Brussels, there was an economic study by the Department of Agriculture which discussed imaginary systems for the better utilization of the soil, showing the disadvantages of dividing up crops and of long distances between the different fields, especially from the point of view of the employment of agricultural machines.

The following systems were examined:

The theoretical agriculture of the State or other public authorities; agriculture as practised by a body of agriculturists, and finally, the work of private individuals undertaken with cooperative use of agricultural machinery, the ground having been suitably parcelled out. With regard to the latter system, a plan is given of the complete parcelling out of land by an Agricultural Commune, including exchange of plots, road-making, repartition of crops, rectification of boundaries, etc.

In Italy, the recent competition for the use of electricity in agricultural operation, organised by the Agricultural Society of Lombardy, is already a significant exemple and a great encouragement.

KING, JAS. A. **The Use of the Traction Engine for Spring Work.** (Work with the Tractor Last Spring). — *Farmer and Breeder*, Vol. 35, No. 2, p. 7. Sioux City, Iowa, January 11, 1912. **880**

United States: Iowa

On a farm in Iowa 330 acres of spring grain were sown. The soil is of such a nature that drills could not be successfully used for spring seeding. Consequently the seed was sown with horses and broadcast seeders. This was followed by a 30 brake-horse-power engine hauling 10. inch disc-harrows, the grain having been sown on fall-ploughed ground. After this it was cross harrowed with the same engine hauling 40 feet of smoothing harrows. In both cases one man was able to operate the engine and its equipment.

The engine and three disc-harrows averaged for the season between four and five acres per hour, while the engine and smoothing harrows averaged about 10 acres per hour. One day 100 acres were dragged in 8 hours. The cost for the day's run was:

Fuel	$ 3 65
Oil and grease	30
Labour	2.50
Total . . .	$ 6.45

Cost per acre 6.45 cents.

On April 22, 60 acres were disked in 7 hour. The expense o this work was as follows:

Fuel	$ 2.95
Oil and grease	.20
Labour	2.50
Total . . .	$ 5.65

Cost per acre 9.4 cents.

On another farm, in which the soil is well adapted for the use of disk drills, about 70 acres were seeded to small grain this season on corn stalk ground. The same engine, 30 brake-horse-power, was used. The equipment hauled behind the engine consisted of a 12 foot heavy I-beam, just behind this a 10-foot four-section two-way disk harrow and immediately behind this a 10-foot disk drill.

The heavy steel beam very thoroughly crushed the stalks and partly levelled off the corn rows. The two-way disk harrow consists of four sections hung to one frame. The two front sections are set in the usual manner and throw the dirt outward. The two rear sections are set in the opposite direction and throw inward the dirt which has been thrown out by the front section. In this way the ground does not present any ridges or irregularities.

It required two men to operate this equipment; one to drive the engine, and one to tend the equipment. On fields without hindrances such as ditches, hedges, etc. this outfit was able to seed from one to two acres per hour. One day 15 acres were seeded in 9.5 hours.

On this day one man operated the outfit alone. The expense for that day was the following.

Fuel	$ 1.86
Oil and grease	.45
Labour	2 —
Total	$ 4 31

Cost per acre for dragging stalks, double disking, and drilling, 28.7 cents.

Another day a five-acre field, cut up by ditches, was seeded in five hours with two men. The five hours included the time to do the work, as well as the time consumed in getting to the field and returning, the distance being about half a mile. The following were the corresponding expenses:

Fuel	$ 1.01
Oil and grease	23
Labour	2 —
Total	$ 3.24

Cost per acre 65 cents.

The rainfall for 1910 was 15 inches below the normal for this section. The months of March and April show a shortage of 0.66 of an inch·

For the same two months there was a total excess of 167 degrees of temperature.

Consequently on the corn land the surface is being constantly worked to keep a proper mulch on the surface. For this purpose the engine is of great help in hauling the two equipments in use. One of these is the two-way disk harrow and smoothing harrow. The other is a 16-inch home-made field planker with a three-section smoothing harrow placed behind it.

Trial of Apparatus for Vine Cultivation, by the German Agricultural Association. (Hauptprüfung der Rebkulturgeräte). — *Arbeiten der Deutschen Landwirtschafts Gesellschaft,* Heft 201. Berlin, 1912. 981

Germany

The German Agricultural Association has experimented with apparatus and methods for the cultivation of the vine, dividing them into four classes :

1st Class : 11 Apparatus : vineyard ploughs, horse-hoes and cultivators. The trials dealt with:

1. Quality of work done.
2. Handling and adaptability of the machines to the different vineyard conditions.
3. Replacing duplicate cutting parts.
4. Amount of traction power required.
5. Weights and prices.

After a detailed description of the machines and of the experiments to which they were submitted, the fact is recognized that they present a high degree of perfection in comparison with the older machines, and that they have for the most part satisfied all reasonable demands made upon them.

II Class : The tests concerned 26 sprayers, comprising knapsack, pack saddle and traction sprayers.

III Class : Six knapsack, packsaddle and traction sulphurers.

The construction of the sprayer nozzles is shown by illustrations of sections of them, and the distribution of the Bordeaux mixture is shown by photographs of paper sprayed with the machines.

The traction sprayers and sulphurers not having yet attained the desired degree of perfection, took only second class prizes, whilst several knapsack sprayers and sulphurers were awarded first prizes.

IV Class : Several methods for tying vines were experimented ; the method described in this *Bulletin* for March 1912, No. 153, took the first class prize.

BUILDING-CONSTRUCTION.

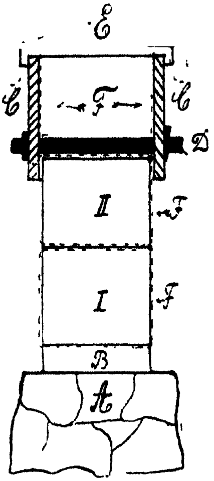
882 WALLENIUS, R. **Reinforced Clay Buildings.** (Etwas über Lehmdrahtbau). — *Deutsche Landwirtschaftliche Presse,* 39. Jahrgang, Nr. 26, pp. 310-311. Berlin, 30. März 1912.

Germany

By Paetz's patented process, cheap agricultural buildings and even dwelling houses can be built of clay. The author has constructed several buildings on this system and has found them very satisfactory. The foundation *A* (see fig.) is built of stone; upon it is placed a layer of concrete (*B*) as wide as the thickness of the wall to be built; according to the load the walls are to bear they must be 10 to 20 inches thick. On the foundation two 1 ½ in. planks (C.C) of any desired length are laid at a distance from each other equal to the thickness of the wall. These planks are held in position by bolts (*D*) passing through holes near their lower edges, and by clamps (*E*) over their upper edges. In the space between the planks galvanized iron wire netting (*F*) is spread on the substructure and against the inner face of the planks, projecting over their upper edges. The space is then filled with clay by one man whilst another rams it down firmly. The clay should be only moderately moist; the use of wet clay must be avoided. It is useful during the ramming to mix sand or coal cinders with the clay. When the space between the planks is full, the projecting strips of wire netting are drawn together and fastened to each other with wire. The boards are then removed and replaced on the top of the course that has just been finished (see fig., I II). The whole operation is repeated until the wall is high enough. It is recommended to spread a layer of concrete on every new wire netting used before filling it up with clay, so as to bind the two wire nets firmly to each other. The window and door frames can be built of concrete or of bricks at the same time as the clay is put in. In large buildings it is necessary to build into the clay walls concrete pillars 18 to 20 feet apart, on which the iron girders for the floors rest. In smaller buildings this is not necessary; the beams can be laid directly on the clay walls and the ceiling and roof put on them.

When the clay is dry enough the outer and inner surfaces of the walls are smoothed, and coated on the outside with about

1 ½ inch of cement, and on the inside with mortar. If the clay is found near the site of the building, this system of building is very economical.



RURAL ECONOMICS.

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Investigations of the Swiss Peasants' Secretariat on Returns from Farming. (Les Recherches du Secrétariat suisse des paysans sur la rentabilité de l'agriculture). —*XIV Rapport annuel du Secrétariat suisse des paysans.* Brougg, 1912.

Switzerland

The courses on book-keeping given at Brougg at the end of February 1910 were attended by 83 farmers. Of these, 63 had sent in utilizable accounts up to the end of the year. Thus, the Secretariat has now 297 complete sets of farm accounts, as follows:

13	for	10	years	in	succession,	beginning	1901
17	»	8	»	»	»	»	1903
24	»	7	»	»	»	»	1904
24	»	6	»	»	»	»	1905
16	»	5	»	»	»	»	1906
24	»	4	»	»	»	»	1907
46	»	3	»	»	»	»	1908
50	»	2	»	»	»	»	1909
83	»	1	year only			»	1910

The 13 farmers whose books began in 1901 have received the medals allotted for ten years' consecutive accounts.

The accounts of 27 farms were not sufficiently well kept to be used in the investigations being conducted by the Secretariat under Dr. Laur, so that 270 remain for use. Since 1908 there has been a falling-off in the number of account-books kept up. This is due to the Secretariat having had to reduce to a minimum the number attending the yearly courses, owing to lack of funds. The methods underlying the elaboration of these accounts require very exact work, and with the present staff and funds it would be impossible to get through a greater bulk of material.

The results of the investigations are given in a special report of the Federal Department of Agriculture, published in the *Annuaire agricole de la Suisse.*

884 **Institute for the Study of the Economics of Agriculture in Great Britain.** — *The Journal of the Board of Agriculture,* Vol. XVIII, No. 12, p. 1029. London, March 1912.

Great Britain

One of the objects to which the grant for Agricultural Research, recently placed at the disposal of the Board of Agriculture and Fisheries, will be devoted, is the maintenance of an Institute for the study of the Economics of Agriculture.

A marked feature of the progress in recent years in the technique of business management, has been the prominence given to what are technically known as « costs ». So far a study of this kind has not been done in relation to agriculture, in Great Britain, but a beginning has been made in the United States by the Bureau of Statistics and some interesting papers on the subject will be found among the publications of that department.

The method adopted by the United States Bureau of Statistics is to place qualified persons on the farms to keep or obtain records of the times spent on each description of agricultural work, the exact weight, and, as far as possible, cost of all materials produced or consumed on the farm. The particulars so obtained are carefully abstracted and tabulated and precise information as to costs is obtained. The need for accurate information on the cost of agricultural operations may be illustrated from the recent controversy in the daily press on the subject of the cost of growing sugar beet. No general agreement has been reached on this vital question; the controversy arises because there is no foundation of hard statistical fact on which to build.

As a rule, farming does pay, but the question as to what description of farming pays best under defined conditions, and why, cannot be answered.

Changes in the Number and Size of Agricultural Holdings in England and Wales.—*The Journal of the Board of Agriculture*, Vol. XVIII, No. 12. London, March, 1912. 885

England. Wales

The number of holdings of the smallest class — 1 to 5 acres — increased in England and Wales during the year 1910-11 by 2085, and in the 5 to 50 acre class by 1601, so that the total increase during the year was 3686.

The above figures represent only net increase and not the number of new small holdings created. The contraction of the cultivated area year by year involves the disappearance of a number of holdings and probably small holdings are swallowed up by urban encroachments in greater numbers than larger farms. An indication of the extent to which the larger holdings are being broken up to satisfy the demand for small holdings is afforded by the figures in the following table showing the changes in the number of holdings of all sizes in England and Wales.

	1 to 5 acres		5 to 50 acres		50 to 300 acres		Over 300 acres	
	1911	1910	1911	1910	1911	1910	1911	1910
England....... ...	82 538	80 429	167 628	166 155	110 110	109 981	14 377	14 531
Wales............	10 210	10 234	32 112	31 984	17 965	17 996	370	364
Total..	92 748	90 663	199 740	198 139	128 075	127 977	14 747	14 895

General Agricultural Data for the United States. (U. S. Dept. Com. and Labor; Press Bull. Folio); *E. S. R.*, Vol. XXV, Abstract Number N. 9. Washington, 1912. 886

United States

This Bulletin contains general agricultural data for the United States, taken from the Thirteenth Census.

It is shown that the increase in the number of farms has not kept pace with the increase in population, the number of farms having increased 10.5 per cent while the total population shows an increase of 21 per cent. A decrease is reported in the average size of farms from 146 acres in 1900 to 138 acres in 1910, but the improved land has increased from 414 499 000 acres in 1900 to 477 448 000 in 1910, a gain of 15.2 per cent. The average value of farm property is shown to have increased from $ 15.57 per acre in 1900 to $ 32.49 per acre in 1910, an increase of 108.7 per cent.

The factors mentioned as contributing to the increased value of farm land include the advanced farm prices of agricultural products; capitalizing the income-producing power at a lower rate of interest than formerly; the cost of improving what was previously unimproved land; the depletion of desirable free land resulting in an increase in the number of buyers; an increased demand for homes in the open country; and the expenditure of much labor and money on various kinds of improvements, such as the building of roads, bridges, schoolhouses, and other rural improvements.

The following table shows more detailed data as to number of farm owners, tenants and managers, as well as average of the farms.

	1910	1900	Increase 1900-1910	
			Number	Per cent
Number of farm owners. .	3 933 705	3 653 323	280 382	7.7
Number of tenants . . .	2 349 254	2 024 964	324 290	16.0
Number of managers . .	57 398	59 085	— 1 687	— 2.9
Farms 19 acres and under	829 303	673 870	155 433	23.1
Farms 20 to 49 acres . .	1 410 992	1 257 496	153 496	12.2
» 50 to 99 » . .	1 435 743	1 366 038	69 705	5.1
» 100 to 174 » . .	1 513 235	1 422 262	90 973	6.4
» 175 to 499 » . .	976 597	868 020	108 577	12.5
» 500 to 999 » . .	124 883	102 526	22 357	21.8
» 1000 acres and over	49 604	47 160	2 444	5.2

The largest increase (21.8 %) is to be found in farms with an average of from 500 to 1000 acres, 22 357 in all.

587 **Systems of Land Tenure in South Australia.** — *Journal of the Department of Agriculture of South Australia.* Adelaide, February 1912.

South Australia

Some interesting statistics showing the area of land under the different systems of tenure in South Australia have been made available by the Surveyor-General of Agriculture (Mr. E. M. Smith). The total area of the State is 243 244 800 acres and of this 9 316 544 acres are held in fee simple. Of the remainder, 617 743 acres have been repurchased for closer settlement, 163 736 dedicated for public purposes, 1 750 333 held under deferred payment system, 3 100 485 leased under right of purchase, 15 185 042 held under perpetual leases, 1 364 920 under miscellaneous leases, and 91 034 450 acres under pastoral leases. The unleased vacant land totals 112 807 537 acres. The amount paid for the 617 743 acres repurchased for closer settlement totals £. 1 883 672.

888

SERPIERI, A. **Alpine Pastures in the Province of Como.** (I pascoli alpini della provincia di Como). — *Atti della Commissione d' inchiesta sui pascoli alpini,* Vol. III, pp. XVI + 370, with map and figg. Società Agraria di Lombardia, Milano 1912.

The Agricultural Society of Lombardy has published the third volume of the acts of the Enquiry Commission regarding Alpine pastures. This volume deals with Alpine farming in the Province of Como.

Italy: Como

The first part of the report gives an analytical description of the alps, called *malghe,* and also touches upon general problems dealing with different kinds of pasture generally attached to permanent stations for cattle, or to mountain pastures (*maggenghi, monti*). In the second part the writer gives the information and the synthetic observations which have been suggested to him by the preceding analyses.

The following is a summary of the most important statistical data:

The 135 Alpine pastures under consideration represent a total productive area of 53 392 acres, of which 47 889 acres (pasturage + productive uncultivated ground) are used exclusively or almost exclusively as pasture, and 5 503 acres (forest) are used both as pasture and as forest, in very variable proportions according to circumstances. It should be remembered that on these Alpine pastures the presence of shrubs is of great importance to the quality.

In a total of 9 760 head of large cattle (sheep and goats are not reckoned), there are 7024 milch cows, *i.e.* about 72 %. Beside these 70 24 milch cows, 5454 young cattle of various ages are grazed. The average grazing time per hectare for large cattle is 45 to 49 days (per acre 18 to 20 days). The maximum in any zone is 111 to 116 days, and the minimum 23 to 29 days. To express these figures as units of hay, the daily consumption of a normal animal in summer is, for various reasons, reduced from 10 kg. (22 lbs.), the figure adopted for the Bergamo Alps, to 8 kg. (17.6 lbs.) for the Como Alps; thus the 45 to 49 days of grazing correspond to a production of 3.5 to 4 qls. of hay per ha. (2.8 to 3.2 cwt. per ac.); the maximum of 111-116 days represents the production of about 9 qls. (7.2 cwt. per ac.) and the minumum of 23-29 to 2 qls. (1.6 cwt. per ac.). For the Alps of Bergamo, a general average of 4.5 to 5.5 qls. (3.6 to 4.4 cwt.) has been arrived at, a maximum of 6 to 9 qls. (4.8 to 7.2 cwt.) and a minimum of 3 to 3.5 qls. (2.4 to 2.7 cwt.).

With regard to the possession and terms under which the Alpine pastures of the Province of Como are held:

The greater number, 122, belong to a Commune, usually to that in which the pastures are situated; in some cases, they are the property of different Communes, each having a fixed share. Only a few, 15, are the property of private individuals. With regard to the terms of lease, the three following groups may be made:

a) Alps (communal or private) rented: 79 % in number, and support 53 % of the total number of cattle.

b) Alps (communal) utilized directly by the inhabitants of the Commune: 19 % of total, and support 15 % of the total number of cattle.

c) Alps (private) utilized directly by their owner: 2 % of the whole, and supporting 2 % of the total number of cattle.

With regard to the different systems of tenure, very often the leasing of the communal alps is arranged with the members of the particular Commune. The alps therefore still form annexes for summer grazing to the small farms of the members of the Commune, even when these are not the direct or sole users of them.

Among the different modifications of this custom, there is one which is much to be deprecated, where the tenant only has the use of the alp during the three summer months; while the members of the Commune who live on the borders, or near, have free pasturage during the spring and autumn. The writer maintains that such an arrangement can have no place in a rational system of Alpine farming. One or other of the two following systems must therefore be adopted: the pasture must either be used throughout the whole year directly by all the members of the Commune, associated and organized in a rational way, or the tenant must have the right to the pasture in the spring and autumn, as well as during the summer.

This tenant could be a responsible person to whom the cattle of the inhabitants of the Commune might be leased.

It is not possible to review here all the different forms of tenure in vogue in the alps of the Province of Como. It suffices to mention that various leases exist which allow the manager of the alps to make an agreement for the cattle of the members of the Commune to graze also during the summer months. This is done by an intervention of the owning Commune, which imposes upon the lessee certain restrictions and rules, in order to protect the interests of the members and to assure to them adequate grazing right.

This intervention, exceeding its legitimate limitations, sometimes amounts practically to an Order of Public Service.

The passage from individual ownership to well-organized cooperative ownership is often long and difficult, and it cannot be denied, that the form met with in the Province of Como represents a first step in this direction of comparatively easy adoption. It is doubtless preferable to the indiscriminate use by the inhabitants of the Commune, though equally inferior to the co-operative arrangement which has been proposed by the Enquiry Commission, and has its use as a transitional measure.

Care must be taken, however, that the intervention of the owning Commune in the interests of the members shall not prove too oppressive to the tenant, for a certain margin of profit must of necessity be permitted to him where a proper use of the pasture is expected.

With regard to the necessity of organised and settled subsidies for the improvement and organization of Alpine pastures, and as ar as the founding of a credit system for these improvements is concerned, the Enquiry Commission refers those interested in the subject to the preceding reports.

To the examples already quoted of Switzerland and France, the writer adds Austria, as the organization adopted in the latter country presents some points worthy of mention.

The State contributions to Alpine improvements (buildings, irrigation, water conduits, roads, drainage, clearings, etc.) are made in different ways in the various Austrian provinces, according to the provincial legislation. Where the service can be better organse t oin to that which is entrusted with the superintendence and the utilization of mountain land. Thus the improvement work is done at the same time as the reorganization of the right of usage, and the administration of the collective estates; the subsidy which is granted is subordinate to the condition that the above mentioned reorganization shall have been carried out, or at any rate begun.

The following fact is characteristic: in Switzerland, the owners do the improvements, and the State, on approving the work, grants the subsidies: in Austria, on the contrary, the owners only have to request a local Alpine Commission for the assistance of the State in carrying out the improvements which they point out and describe in a general manner; if their request is granted, the work is carried ont by Government experts. The owners contribute to the expense according to a definite scale, which varies from 25 to 40 % of total cost; they have also to pledge themselves to keep up the work.

The wishes of the Enquiry Commission with regard to Italy will be met (with due regard to special conditions) if Raineri's bill becomes law. This prescribes the granting of subsidies by the State for the purpose of making and improving mountain pastures and meadows, and organizing the conditions of their use. This scheme, at all events in part, answers to the desire of the Commission, which is expressed in the preceding reports, as it does not deal only with forestry, but includes pastoral interests, and would provide a techical provincial Committee to deal with the whole question of mountain restoration.

With regard to the solution of the problem of local rearing of cattle for milking purposes, in order to satisfy the demands for milch cows on the dairy farms of Lower Lombardy, it must be borne in mind that the small proprietors of the Province of Como are (with exceptions) behind the inhabitants of the Province of Bergamo in an organization capable of furnishing the plains of Lombardy with good dairy cattle.

On the other hand, the peculiar conditions of some valleys will enable them, in all probability, to retain in the future a more important and in reality more remunerative position with regard to cheesemaking than to the breeding-industry.

The writer therefore concludes that the Alpine economy of the Province of Como will probably be behind the other Alpine provinces of Lombardy in the production of native dairy cattle.

889 HEUMANN and GÜNGERICH. **The Statistics of the Agricultural Book-Keeping Co-operative Society.** (Die Statistik der landwirtschaftlichen Buchführungsgenossenschaft). — *Land- und Forstwirtschaftliche Zeitung Georgine,* Nr. 20 und 25. Königsberg 9. und 28. März 1912.

Germany: East Prussia

The Co-operative Society for Farm Bookkeeping in East Prussia (Landwirtschaftliche Buchführungsgenossenschaft) has communicated to its members, since its foundation in 1904, the principal data of the cost of exploitations, which are entered in its books, and the figures given refer to 1 ha. (2.47 acres) of cultivated land. The increase in the number of estates which figure in these statistics causes the data furnished by this society to increase daily in value for the study of the economy of the agricultural exploitations of a given district.

The net income per ha. of the area cultivated for seven years, 1904-1911, has not increased, contrary to what might have been expected from the steady increase in value of the land.

The net income has been affected by the direct price of the products and by the season. The minumum yield was in 1907, and was due to the rainy summer which also affected the crops of 1908.

What has chiefly characterised the economy of farming of late, has been the ever increasing outlay for building, for the increase of live stock and equipment, for chemical manures and food stuffs for the cattle, etc. Owing to this, the capital invested in the estate is augmented from year to year, without a proportional net income corresponding to the greater expenditure.

It cannot be said that the large consumption of chemical fertilisers or concentrated foods is always advantageous or the reverse, for if, on the one hand, the estates which spend less on food stuffs give the best revenues, on the other, the estate which pays the best is one which expends upon concentrated food stuffs a sum double the average of that contributed for this purpose by all the other estates.

The success of the enterprise evidently largely depends upon the relation existing between the organization of the farm itself and the individual technical capacity of the farmer.

From statistical data taken from the accounts of these farms, it is found that the production of cereals (especially of spring cereals) has been somewhat low, and this is doubtless due rather to unfavorable seasons, than to faulty rotation or distribution of the crops. On the other hand, milk production has increased to such an extent that it reached last year the average of 2872 litres (632 gallons) per milch-cow.

Nevertheless, the economic result was not very satisfactory, seeing that the average price of milk was only 9.6 pf. per litre (5.13*d* per gal.).

Army remount horses have increased considerably in price, from 881 M. (about £43) in 1904-1905 to 1001 M. (about £49) in 1910-11. Cost of labour is continually increasing and represents about a third of the total expenses.

The two following tables give the monetary increase per acre of the cultivated area from 1904-05 when the Society was founded, to 1911; the farms which are now included in the Book-keeping Bureau are 96 in number.

I.
Income in cash per acre of cultivated area.

Agric. year	No. of farms	Sale of cattle and milk *s. d.*	Sale of raw products *s. d.*	Sale of various other products *s. d.*	Total *s. d.*	Net income *s. d.*
1904-1905	18	29. 9	21. 5.67	2. 10.77	54. 2.15	18. 5.95
1905-1906	45	38. 1.25	17. 5.57	12. 8.41	68. 3.24	16. 8.00
1906-1907	57	44. 5.45	23. 5.02	11. 9.82	79. 8.41	19. 4.91
1907-1908	70	38. 4.10	16. 0.42	9. 1.07	63. 5.60	11. 4.22
1908-1909	74	38. 6.01	18. 7.86	9. 2.97	66. 4.85	13.11.65
1909-1910	89	42. 10.4	25. 6.26	7. 3.63	75. 8.30	19. 3.48
1910-1911	96	46. 8.60	20. 0.55	7. 1.25	73. 9.91	15. 9.09
Average		39. 8.30	20. 2.91	8. 8.78	67. 7.14	16. 5.66
% income		58. —	29. 5	12. 5	—	—

II.
Expenditure per acre of cultivated land.

Agric. year	No of farms	Purchase of cattle *s. d.*	Purchase of seeds *s. d.*	Purchase of fertilizers *s. d.*	Purchase of food-stuffs *s. d.*	Wages and Salaries *s. d.*	Upkeep of buildings machines and tools *s. d.*	Various *s. d.*	Total *s. d.*
1904-1905	18	8.11.16	2. 0.29	2. 4.10	3.9.72	11.10.89	4. 0.58	9. 4.88	37. 5.63
1905-1906	45	13. 5.94	1.11.81	3. 2.58	5.3.35	11.10.89	3.10.68	8. 7.83	50. 9.66
1906-1907	57	16.11.38	2.6 —	3. 6.39	6.2.30	13. 4.99	5. 2.39	10. 2.41	59. 0.26
1907-1908	70	12. 0.79	3·0.67	3. 0.20	6.7.06	15. 4.80	4. 8.68	9. 8.69	54. 6.91
1908-1909	74	11. 9.46	2.5.53	3.11.15	7.1.73	15.10.52	4. 8.68	11. 2.79	56. 1.48
1909-1910	89	12. 8.41	2.7.91	4. 3.44	7.6.92	16. 1.87	4.11.06	10.10.03	55. 8.58
1910-1911	96	12.11.27	2.9.81	4. 9.16	8.5 93	16. 5.19	5. 0.94	4. 4.87	59.11.21
Average		12. 8.41	2.4.58	3. 6.87	6.6.59	14. 8.23	4. 9.16	8.11.17	53. 7 —
% of expenditure		24	4.5	6.7	12.2	27	9	16.6	—

The statistics of these seven years which represent data obtained from a large number of farms in East Prussia close with a net yield of 41.5 M. per ha. (16*s* 5.66*d* per acre) of cultivated area, which on the basis of 3.5 % interest, gives an average value of 1200 M. per ha. (£23.16*s* 3 ½*d* per acre).

As regards the owner, however, in this estimate no account is taken of interest due, generally at 5 %, taxes and other personal expenses.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS

840 GRATZ, OTTÓ and NARAY ANDOR. **The Value of Catalase, Reductase and Leucocyte Tests for Milk as Hygienic Measures, especially for Milk containing Streptococci.** (A katalase, reduktase, és leucocytaproba értéke a tey egészségügyi elbirálásánál különös tekintettel a streptococcus tejre). — *Kisérlets Közleményck,* No. XIV. Cah. 3. 1911.

Hungary

In the experiments carried out by the authors, the catalase test showed itself very sensitive, revealing even the anomalies of a milk which submitted to the leucocyte test gave a residue inferior to 1 ‰ by volume.

Nevertheless the presence in milk of small quantities of blood arising from capillary haemorrhage is capable, according to the authors, of raising considerably the catalase figures. This haemorrhage most frequently occurs shortly after calving, but also at other periods, and as the catalase test is sensibly influenced even by a very small quantity of blood in the milk, it is necessary in order to prove with certainty that the cow is suffering from strepto-mastitis, to submit the milk to the leucocyte test, and besides to examine it under the microscope. The reductase tests (according to Barthels) and Schardinger's reaction have given only uncertain results as to strepto-mastitis.

841 TRILLAT, A. **The Causes of the Curdling of Milk observed during Stormy Weather.** (Etudes sur les causes du caillage du lait observé pendant les périodes orageuses). — *Comptes rendus de l'Académie des Sciences,* Tome 154, No. 6, pp. 372-374; No. 9, pp. 613-616. Paris, 5 et 26 Février 1912.

France

It has long been observed that certain foods, such as milk, meat, broth, etc., spoil rapidly during stormy weather. In dairies especially it has been noticed that milk transported while a storm is raging, often arrives, if not partly curdled, at least very much soured and deteriorated for the purposes of sale or for industrial utilisation. Similar observations have repeatedly been made in households. These rapid alterations have been attributed to the action of electricity and to the ozone produced by it, a theory which has long prevailed in the public opinion. Others on the contrary hold that this spoiling of food is only the effect of the high temperature and hygrometric condition of the atmosphere, both conditions which favour the acidification of milk.

The author has investigated the question experimentally, submitting numerous samples of milk to the action of air electrified in various ways (by sparks and by effluvia), and comparing them with other samples of the same milks exposed to ordinary air otherwise under identical conditions; the process of acidification was ascertained by volumetric determinations. Similar experiments were conducted in the presence of ozone, of ammonium nitrate and of the nitrous vapours which might be formed during storms by the action of electrical discharges.

These experiments carried out during several months never gave any results showing a greater activity of the processes of acidification. The effect of the gases tried, when it could be estimated, was always rather antiseptic than not. It was not in this direction then that the explanation of the phenomenon was to be sought.

The author had previously remarked that infinitely small traces of putrid gases favour the development of lactic ferments. As atmospheric depressions cause the disengagement of the gases contained in the soil and in matter of all kinds (it has been observed that smells are more easily perceptible during storms) the author supposed that barometric depressions might be the cause of the rapid curdling of milk. In order to test the correctness of this view the Author suspended inside and in the upper portion of sterilised glass bell-jars some slips of paper bearing lactic ferments ; on the plates of some bells he placed cultures of *Proteus* in decomposing broth and on others some vegetable earth containing organic matter decomposing under the action of *Proteus vulgaris*. He then diminished the pressure under some bells (leaving the others as controls) by 0.2 to 2 inches, carefully keeping the other conditions of heat and of moisture unaltered. After some hours the lactic ferments were sown in sterilised milk. It was thus seen that the acidity of the milk increased most rapidly under those bells in which the pressure had been diminished, that is, where the emanation of putrid gases had been favoured.

Conclusions: 1. Barometric depressions have the effect of determining the disengagement of gases contained in the soil and in other bodies, and thus facilitate the formation of surroundings favourable to the conservation and activity of the lactic ferments in suspension in the air. Stormy weather would thus produce, in localites in which decomposing substances are abundant, the best conditions for the contamination of milk, and this all the more readily on account of the generally prevailing high degree of temperature and of moisture. The coincidence of these various factors is sufficient to anticipate by several hours the curdling of milk.

2. It is probable that the earlier spoiling of other organic substances (meat, baker's yeast, fermentable liquids, etc.), which happens in stormy weather, may be explained in the same way.

3. Lastly, howsoever hazardous the hypothesis may seem, one is tempted to see a connexion between the above results and the facts so often observed of the sudden spread of epidemics and of the aggravation of sores following on meteorological disturbances.

GULIK, Dr. H. von. **An Improved Butyrometer for Determining the Fat-Content in Cheese.** (Ein abgeändertes Butyrometer für die Fettbestimmung in Käse). — *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel*, Bd. 23, Heft 3, pp. 99-101. Münster, 1. Februar 1912. **842**

Germany

Experiments made according to different methods to determine the fat content in cheese, have shown that Gerber's test for acidity, if rightly carried out, gives quite reliable results and has the merits of rapidity and cheapness.

The Gerber butyrometer, with a graduated scale of 1-100, which has hitherto been used, is however better suited for determining the fat content in butter than in cheese and also requires to be filled with 5 gr. of cheese. It is almost impossible to get a large enough sample from a single hole in a cheese in order to carry out a second determination while, on the other hand, making two holes should be avoided.

The writer is having an improved cheese butyrometer made by Messrs. Gerber and Co., with a scale graduated from 1 to 40, and thus allowing of a reading 2.5 times more exact than in the case of a scale graduated from 1-100. It is moreover constructed to take a cheese sample of 3 gr. only, and is thus somewhat shorter than the former butyrometer.

The writer suggests that the test should be made in the following manner, which he has found to be satisfactory. The wide portion of the butyrometer is half-filled with sulphuric acid of specific gravity 1.50, 3 gr. of finely divided hard cheese are weighed in a porcelain dish (soft cheese is weighed in the little glass recommended by Dr. Gerber), and with the help of a brush and a funnel, the whole of the sample is put into the wide part of the butyrometer. The latter is then placed in a water-bath of 65-70° C., care being taken to shake it round frequently. When the cheese has been dissolved for some time, the butyrometer is withdrawn, and 1 cc. of amyl alcohol is first added, then sulphuric acid to the 35th degree, and the butyrometer is reversed in order to mix the liquids, care being taken however to *avoid shaking*.

The apparatus is then placed in the water-bath at 65° C. for 5 minutes, centrifugated for 4 minutes, 1 000 turns per minute, and replaced on the water-bath at 65° C., when the content of fatty matter is read from the scale.

If the surrounding temperature is low, the centrifugal apparatus must be warmed before use.

848 GOODWIN, WILLIAM and SADLER, WILFRID. **Milking Machine Trials.** *Midland Agricultural and Dairy College, Kingston-on-Soar, Derby Bulletin*, No. 1, 1911-12.

Great Britain

During the first trials of the milking machine of the suction type, which extended over a period of 10 weeks, it was found that it was extremely difficult to keep it in a suitably clean state, and that it always had a disagreable odour. The milking and the cleansing of the machine were done by a workman without any special technical knowledge, such as one would find on ordinary farms, and under the superintendence of several members of the teaching staff. In order to study the influence of machine milking on the milk, two cheeses were made each week, using 12 gallons of milk for a cheese, one from machine milk and one from hand milk, while the same proportion of a pure culture starter was added to each, and the process of cheese making was exactly the same in both cases. Other cheeses were made without the addition of starter.

The ripe cheeses were examined and those made with machine milk to which starter had been added were of average quality, whereas those without starter developed a somewhat putrid taste and smell. The cheese made with hand drawn milk was of superior quality when the starter had been added, whilst without starter it developed also the same unpleasant odour, but less markedly than in the cheese made from machine milk.

In a second series of experiments, the working of the machine was in the hands of a skilled mechanician, the cleansing being done with the greatest care. The teat cups were soaked in soda solution, or lime water. It became thus possible to make a good quality of cheese, without the addition of starter, by keeping it during the night at a temperature favourable to the spontaneous development of lactic acid.

Samples of milk were examined as to their bacterial content, by means of agar and gelatine cultures, and it was found in the second series of trials also, notwithstanding the fact that the machine was entrusted to a skilled mechanician, that the number of bacteria in the machine milk was considerably higher than in the hand milk.

Summing up it may be stated that bacteria injurious to the successful manufacture of cheese easily find favourable conditions of life in milking machines, unless great pains are taken to keep their parts scrupulously clean.

The addition of a sufficient quantity of starter may suppress or limit the development of the injurious bacteria.

PAVARI, ALDO. **The Milk Supply of a Large City.** (La fornitura del latte a una grande città). — *Il Coltivatore,* Anno 58, No. 9, pp. 264-267. Casale Monferrato, 30 Marzo 1912. **844**

Germany: Saxony

In a report sent from Tharandt (Dresden) the Author describes, and illustrates with five photographs, the fine establishment erected and equipped at Dresden for the milk supply of that city, and called the " Dresdener Milchversorgungsanstalt ". It was founded in 1907 by the milk producers of the environs, united in a powerful association.

The milk is paid to the producers according to its fat content, thus stimulating the cow-keepers to improve to the utmost their stock and at the same time insuring the supply of the best milk.

On the ground floor of the building, in a large room, the milk, which arrives from the country in large tin cans, is filtered and poured into tanks, whence by means of pumps it is sent to the first floor and stored in other tanks. These are situated in rooms where refrigerating pipes keep the temperature constantly at 2 to 3° C. (35.6° to 37.4° F). In the tanks on the first floor the milk stands 13 to 15 hours, during which time the coarser impurities settle. Then the milk is passed into large separators where it undergoes a light centrifugation (700 to 800 revolutions per minute). This does not separate the fat, but it is sufficient to eliminate all foreign matters. A great portion of the milk is then sterilized. The bottling of the milk and the washing of cans and bottles are performed by machinery. The empty cans before being washed are placed in a draining room where 80 or 90 litres (18 to 20 gals.) of milk are collected daily.

Every bottle is closed with a cardboard disk which bears the date on which it was filled.

The establishment is provided with the necessary plant for the manufacture of butter, cheese and yoghurt.

Refrigeration is produced by compressed carbon dioxide. The power required by the machinery is 125 H. P., and this is sufficient for handling 9000 litres (1980 gals.) of milk per hour; but the average quantity treated every day is about 6000 litres (1320 gals.) per hour.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

845 Last Year's Sugar Crop in France.

1. Les fabriques de sucre et leurs procédés de fabrication pendant la campagne 1910–1911. — *La sucrerie indigène et coloniale*, T. LXXIV, No. 7, pp. 143-149. Paris, 13 Février 1912.
2. Les fabriques de sucre et leurs procédés de fabrication, campagne 1910-1911. — *Supplement au Journal des Fabricants de sucre du mercredi 14 Février 1912.*
3. Chronique. — *Journal des Fabricants de sucre*, LIII A., No. 11. Paris, 13 Mars 1912.
4. Hitier : Notes d'Agriculture. — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, T. 117, No. 2, pp. 243-253. Paris, Février 1912.

As has already been done for Germany (1) it will be interesting to compare the results of the French sugar season of 1910-11 with that of the year 1901-1902.

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(1) See *B*. Feb. 1912, No. 403. *(Ed.)*.

Season	Sugar mills at work	Area	Yield per acre	Beets treated	Total sugar	Refined yield	Molasses produced Total	Molasses produced Yield
		Acres	Cwt.	Tons.	Tons.	%	Tons.	%
1910-1911	239	564 740	191.97	5 424 239	640 081	11.80	216 255	3.78
1901-1902	332	771 788	238.16	9 201 237	1 035 099	11.25	374 602	4.07

In the amount of refined sugar the calculated quantity contained in the molasses is included. This quantity was calculated up to September 1,1903 at the rate of 14 %, and after that date at 5 % by weight.

Of practical interest are the following general agricultural and technical considerations.

Beetroots. The area under beets in 1910-11 was greater by 11 708 acres than that of the preceeding year; but, on account of the unfavourable weather conditions, the average yield per acre was 30.18 cwt. less. This considerable reduction notwithstanding the greater area under beets diminished the total quantity of beets worked by the mills by 722 664 tons. And in spite of the rise in the average price of beets from 24.37 fr. (19*s* 4*d*) per metric ton to 26.52 (21*s*), the revenue of the French beet growers decreased by 6 045 982 francs (£ 240 025), as follows:

$$1910\text{-}1911: \frac{5\,512\,429\,084 \times 26\,52\text{ fr.}}{1000} = \text{fr. } 146\,189\,619\ (£5803\,728)$$

$$1909\text{-}1910: \frac{6\,246\,844\,540 \times 24\,37\text{ fr.}}{1000} = \text{fr. } 152\,235\,601\ (£6043\,753)$$

Applying the above average prices, in 1911 each hectare yielded 639.38 fr. (£ 10.4*s* 7 ¼*d* per acre), as against 679.92 fr. per hectare (£ 10.17*s* 7*d* per acre) in 1909-10, or 40.54 fr. per ha. (12*s* 11 ¾ *d* per acre) less.

Extraction of sugar. The tendency to concentrate the handling of the beets in a small number of factories has lately become more marked; in fact, there were five working factories less than in the preceding season.

The 239 sugar factories of 1910-11 comprise 188 simple installations and 51 central ones; to the latter, installations for preparing the juices alone (râperies) being attached. The production of refined sugar, including the calculated amount contained in the molasses used by farmers or distillers or sent abroad, diminished by 834 148.68 qls. (82 080 tons). This decrease is due to the smaller quantity of beets handled, because the yield of sugar was somewhat higher, from 11.7 to 11.8 %.

Dividing the total weight of beets by the number of working factories, the average for each is 230 645.56 qls. (22 696 tons) or 25 372.65 qls. (2 497 tons) less than the amount of the preceding season; the average amount of sugar produced by each factory was 27 217.05 qls (2 678 tons) as against 30 077.93 qls (2 960 tons). The total number of working days in the factories was 14 318 as compared with 16 226 of the previous season; the average for each factory being 59.9 as against 66.5. As for the extraction of sugar from molasses there were no changes in the number of factories which remained: 1 using Steffen's process, 3 Steffen's lixiviation process and 1 Say and Mastaing's.

By-products used in agriculture. The total outturn of pulps was 25 911 794.6 quintals (2 549 720 tons) which at an average price of 4.42 frs. (3*s* 4 ½*d*) per metric ton, yielded 10 986 582 fr. (£436 167), while in the preceding year the returns from this item were 12 016 479 frs. (£ 466 240) at an average price of 4.13 fr. (3*s* 3 ¼*d*).

The weight of molasses used in agriculture was:

1910-1911	422 985.28 qls.	(41 622 tons)
1909-1910	460 256.13 »	(45 289 tons)
or	37 270.85 qls.	(3 667 tons) less.

The ratio between the consumption of sugar and its production was.

	%
1910-1911	107.5
1901-1902	43.5

This deficit will increase in the 1911-12 season, considering that also in France owing to the exceptional drought that has prevailed, a greatly reduced production is to be expected.

In consequence of the above disequilibrium a sudden rise in the price of sugar has taken place. Thus on the Paris Exchange white sugar no. 3, which was quoted at the end of January 1911 at 31 to 31.25 fr. per quintal (12*s* 6*d* to 12*s* 7*d* per cwt.), rose at the end of September of the same year to 63.25 to 63.75 fr. (25*s* 6*d* to 25*s* 8 ½*d*) and recently, at the beginning of February, to 48.75 to 49.50 fr (19*s* 7 ¾ *d* to 19*s* 11 ½*d*).

846 **Enforcement of the Law of April 5, 1908, against Frauds in the Olive Oil Trade in Italy.** (Applicazione della legge 5 aprile 1908 contro le frodi nel commercio dell'olio di oliva in Italia). — *Bollettino del Ministero di Agr. Ind. Comm.* Anno IX, Vol. I, Serie A, fasc. 8, pp. 216-217. Roma, 24 Febbraio 1912.

Italy

Of the 2049 samples of olive oil analysed during the year 1910-11, 244 or 11.9 % were found to be adulterated, while in the preceding year the number of adulterations was 12.39 %, and in 1908-1909, 16.04 %. This improvement shows the efficacy of the law in limiting the sophistication of oil.

According to the results of the analyses made, it appears that the oil most commonly used to adulterate olive oil is sesame oil, next comes cotton seed oil; ground nut oil is more rarely employed, and least of all soy bean oil. At the Higher School of Agriculture of Pisa some samples were found containing linseed oil, and at the Experimental Oil Factory at Spoleto one sample was proved to be adulterated with maize oil. The Municipal Bureau of Hygiene at Siena called the attention of the Ministry to an adulteration, frequent in that province, consisting in the admixture of oil of paraffin; in the Val d'Elsa oil from red dogwood (*Cornus sanguinea* L.) (1) is used.

In 187 samples that were analysed, the Director of the Siena Bureau found 8 that contained cotton seed oil, 14 oil of paraffin, and 18 red dogwood oil; these two latter adulterations however were not found by any other laboratory.

The greatest number of adulterations was discovered to be in Tuscany, the average being 24.54 %. Next comes Lombardy with 19.9 %, Abruzzi with 15.32 %, Emilia 7.97 %, the Southern Mediterranean provinces, excluding Calabria, 7.61 %, Latium 6.82 %, Venetia 5.88 % and the other regions with decreasing figures.

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(1) Cf Prof. Dott. Siro Grimaldi's paper on this oil: Nuovo contributo alla ricerca delle sofisticazioni dell'olio di oliva. *Le Stazioni sperimentali agrarie*, Vol. XLIV, fasc. 3-4. Modena, 1911. (*Ed*).

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

847 **An Ordinance for the Prevention and Eradication of Diseases and Pests affecting Vegetation.** — *Trinidad and Tobago. Plant Protection,* No. 35. Dec. 18, 1911.

Trinidad and Tobago

The Governor of Trinidad and Tobago has issued an Ordinance entitled "Plant Protection 1911" containing general regulations for the prevention and combating of plant diseases in that colony.

It contains the rules for the payment of inspectors, and the limits of inspection; prohibitions relating to the importation of plants; regulations for the confiscation of imported plants; the registration, inspection and quarantine of nurseries, methods of combating different diseases, the expenses and indemnities incurred, penalties incurred by infringement of the said regulations, etc.

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

848 **Work done by the Royal Hungarian Station of Plant Physiology and Pathology and by the R. Hungarian Station of Entomology.** — *A. M. Kir. Kormány 1910 évi müködéséröl és az ország-közállapotairól szóló jélentés* (Extract from Report of Hungarian Government on Work done in 1910).

Hungary

The Royal Hungarian Station of plant physiology and pathology has conducted some experiments in order to determine the best remedies against the diseases of plants (especially cereals), others on the inoculation of "heart-rot" in sugar beets and on the manufacture of sugar from maize. The Station has also dealt with the desiccation of seeds with a view to improving their quality, and with the physiological role of oxydase.

Concurrently with the Institutes of plant pathology of Vienna and Berlin the Station has continued the study of the diseases of the potato.

Besides the extermination of locusts at Hortobágy, the Royal Hungarian Station for entomology has actively pursued the control of various injurious insects. It has drawn up instructions for the destruction of black cicadas, for the protection of lucerne fields against various pests, and lastly for the destruction of field mice by strychnine and phosphorus pills.

849 DE CÉRIS, A. and SAGNIER, H. **Control of Plant Parasites.** (Lutte contre les parasites des végétaux). — *Journal d'Agriculture pratique.*, 76^e année, tome I, No. 11, p. 329. Paris, 14 Mars 1912.

France

The Agricultural, Scientific and Literary Society of the Pyrénées Orientales has appointed a Committee for studying the question of plant parasites and for combating their ravages, especially as regards fruit trees and market-garden produce. The Society's seat is at Perpignan.

The Committee's work will comprise:

a) The search for parasites.

b) The determination of the causes which favour their multiplication.

c) The study of control measures.

d) The testing of anti-parasitic products and apparatus.

e) The teaching of operators.

f) The demonstration of the remedies and their application.

g) The regulation of contracts made for treating and protecting, at a moderate outlay, small plots of land.

The committee will consist of:

1) A council of superintendence; to organise the demonstrations, and watch the working of the *à forfait* contracts; and

2) An administrative council; to determine the most important researches, control the experiments made with products and apparatus, and verify the results.

BACTERIAL AND FUNGOID DISEASES

GENERALITIES.

BOIS, D. and GRIGNAN, G. T. **Questions of Vegetable Pathology at the Pomological Congress at Limoges in 1912.** (Le Congrès pomologique de 1912). — *Revue horticole*, 85e année, No. 6, p. 121. Paris, 16 Mars 1912. **850**

At the Pomological Congress, which will be held this year at Limoges, the following questions will be discussed among others:

a) the diseases of stone-fruit and the remedies; **France**

b) the use of tobacco juice as an insecticide for fruit trees, and its possible substitutes;

c) substances likely to be of value among the old insecticides.

FUNGOID DISEASES.

SYDOW, H. and P. **New Parasitic Fungi from Russia.** (Einige neue parasitische Pilze aus Russland). — *Annales Mycologici*, Vol. X, No. 2, pp. 214-217. Berlin, April 1912. **851**

The following is a list of the new fungi found in different parts of Russia by Prof. O. Treboux between 1906 and 1911.

Ustilago Trebouxi, on the leaves of *Melica ciliata* and of *Triticum cristatum*. **Russia**

Uromyces Ceratocarpi, on the leaves, fruit and stalks of *Ceratocarpus arenarius*.

Uromyces Kochiae, on the leaves of *Kochia prostrata*.

Puccinia proximella, on the leaves of *Chrysanthemum* (*Pyrethrum*) *millefoliatum*.

Puccinia Trebouxi, on the leaves of *Melica ciliata*.

Puccinia permixta, aecidia on the leaves of *Allium decipiens*, *A. moschatum*, *A. rotundum*, *A. sphaerocephalum*; the uredospores and teleutospores on the leaves of *Diplachne serotina*.

Puccinia festucina, on the leaves of *Festuca ovina*.

852 NOFFRAY, E. **Oak Mildew in Sologne in 1911.** (L'Oïdium du Chêne en Sologne en 1911). — *Journal d'Agriculture pratique*; 76 année, Tome I, No. 14, pp. 432-433. Paris, 4 Avril 1912.

France: Sologne

In 1911, oak mildew was not so severe in character, and the damage it caused was not a third of that due to its attacks in preceding years.

As a rule, oaks of more than five years of age, if not immune, were slightly affected, and often attacked very late. Young individuals, on the contrary, especially those from one to two years old, were infected by the parasite.

The writer thinks that, if regular felling were omitted for some years, the disease would gradually disappear.

853 RAVAZ, L. and VERGE, G. **The Conditions determining the Appearance of the Conidiophores of Vine Mildew.** (Sur les conditions d'apparition des conidiophores, « taches blanches », du Mildiou). — *Le Progrès Agricole et Viticole*, 29e année, No. 10, pp. 296-300. Montpellier, 10 Mars 1912.

France

The writers undertook experiments to determine whether the conidiophores of *Peronospora* can develop at the same temperature which is favourable to the germination of the conidia. Experiments made upon leaves cut from vines in the open, and placed in a moist chamber, resulted in the appearance of conidiophores if the temperature reached 13°, and provided this temperature was maintained for 20 hours.

Peronospora appears most rapidly upon the leaves at about 20° C.; at this temperature one very damp night suffices for its appearance. Its further development does not depend upon temperature (the necessary temperature being nearly always attained in summer) but chiefly upon the humidity of the air.

At higher temperatures, *Peronospora* grows less rapidly, and requires more than one night or day of 12 hours. Towards autumn, the temperature becomes again more favourable to the spread of this disease.

854 DALE, ELIZABETH. **On the Cause of "Blindness" in Potato Tubers.** — *Annals of Botany*, Vol. XXVI, No. CI. London, January 1912.

Great Britain

The disease known as "blindness" in potato tubers is so called because it more or less completely destroys the "eyes" so that tubers thus affected are worthless for use as seed. In addition, the surface of the tubers becomes rough and dark brown on account of a large formation of cork.

When such a tuber is placed in damp air it becomes covered with a fine white mycelium, belonging to *Verticillium albo-atrum*, which produces the characteristic small conidia. This mycelium grows up into the new shoots, when any are formed, and in some cases it may pass into the subaerial shoots. In other cases it never goes beyond the subterranean stems and creeps along them into the newly formed tubers, *internally* as a colourless mycelium in the cortical tissues, and *externally* as a scanty thin brown mycelium. Thus the tubers may be infected by means of vegetative mycelium only, without the formation of any kind of spore. The course of the fungus from the old to the new tuber may be traced by means of the brown coloration of the affected tissues.

Tubers have been grown in three successive years from the original diseased crop, and in each year some have been blind, and have had a warty and corky outer surface.

RESISTANT PLANTS.

PRUNET, A. **The Japanese Chestnut for Reconstitution of Chestnut Plantations.** (Le Châtaignier du Japon à la Station d'expériences du Lindois, Charente). — *Comptes Rendus de l'Académie des Sciences*, T. 154, No. 8, pp. 521-524. Paris, 19 Février 1912. 856

The author has, at the request of the Department of Agriculture of France, organised researches at the different Stations of the Pyrenees, the Central Plateau and the Cevennes, as to the best methods of reconstructing chestnut plantations which had been destroyed by the "Ink Disease" (1). **France**

Observations extending over a period of nine years have proved the resistance of *Castanea japonica* Blume to this disease. Therefore the question arose as to the practicability of replanting chestnut plantations with this immune species (2).

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(1) See *B*. Jan. 1911, No. 332; Feb. 1911, No. 635. (*Ed.*)

(2) *Castanea japonica* Bl., syn. *C. crenata* Sieb. et Zucc., *C. castanea* var. *pubinervis* Sarg., is most suitable for replanting owing to its precocity. (SCHNEIDER, C. K.: *Handbuch der Laubholzkunde*, pp. 158-159, Jena, 1904).

This discovery, which is of great practical interest, was confirmed in a decisive manner by means of experiments carried out at the Experiment Station of Lindois (Charente). Young Japanese chestnut trees were planted, at the same times as those of the native chestnuts, which were to serve as a control, in small groups in different infected parts of three chestnut plantations. Each group consisted, as a rule, of Japanese chestnuts and of two native chestnuts and was protected by a fence. The experiments lasted 2, 3 and 4 years, and the summary of the results is as follows.

a) In the most infected spots, of 30 native trees, all were dead at the end of four years; 23 out of 25 were dead after three years; 13 out of 14 after two years. In all, 56 out of 59 native trees died, and the 3 surviving individuals were in a hopeless condition. In less infected parts, 19 native chestnuts out of 26 died after 4 years, 3 out of 4 in three years, 12 out of 18 in 2 years. In parts hitherto free from infection, all the 14 native trees which had been planted for 2, 3 and 4 years respectively were alive.

b) Of the 90 Japanese chestnuts experimented upon for 2, 3 or 4 years, one died from drought during last summer, 4 did not survive transplanting; that is to say 3 out of 76 in the centres of infection, and 1 in 14 in the healthy parts. The rest lived.

The virulent nature of the " ink disease " in the infection centres at the Station of Lindois, and the immunity shown there, as well as in the other Experimental Stations, by the Japanese chestnuts proves the high degree of resistance possessed by this species, which is shown even more strikingly by the presence of healthy vigorous Japanese trees growing amidst dead or dying native ones.

Numerous cultivated varieties have lately been introduced with success into the United States of America. The fruit is generally very large, but in the case of most of the varieties the fruit is only good when cooked; some of the varieties, however, which have been introduced and acclimatized bear a fruit which equals in taste that of European kinds.

C. japonica is a dwarfish close-headed tree of slender growth; leaves smaller than other chestnuts, usually acuminate. It is less subject to injury by fungi than other species, and is generally considered in America the most valuable for commercial fruit-growing. (BAILEY, L. H.: *Cyclopedia of American Horticulture,* Vol. I, pp. 294-297, Chestnut. 6th ed. New York, 1909). (*Ed.*).

MEANS OF PREVENTION AND CONTROL.

856

HEGYI, D. **Control of American Gooseberry Mildew in Hungary.** (Communicated by M. E. de Miklós de Miklósvar, Delegate of Hungary to the International Institute of Agriculture).

Hungary

The dangerous disease known as American Gooseberry Mildew (*Sphaerotheca mors-uvae*) was introduced into Europe from America, and has invaded all the plantations of North and Central Europe.

The first reports of its appearance were received from England in the summer of 1900; after some years the disease spread to Sweden, Russia, Germany, Austria, and finally in 1907, it reached Hungary.

The Department of Agriculture entrusted the Royal Phytopathological Institute at Magyaróvár (Hungary), of which the writer is Director, with the task of making experiments in combating this disease.

These experiments were wholly successful, and the writer describes the measures which have been efficacious in Hungary.

Bordeaux mixture is used: the first treatment should always be carried out towards the end of February or the beginning of March, when the perithecia of the parasite, having survived the winter, begin to swell. For the first and second applications, before the buds break, 5 % mixture is used.

Before flowering, 3 % Bordeaux mixture should be employed, and when the leaves are fully developed, they should be sprayed with a 5 % mixture.

A fifth application is rarely necessary, but if the mildew shows itself from time to time, it is well to spray the bushes with a 5 % solution once more.

Although liver of sulphur has been much advised, the writer does not consider that it keeps off American gooseberry mildew.

In America, plant diseases have been treated with conspicuous success with a lime-sulphur mixture. Mr. Hegyi is trying it this year, and will report later the results obtained against American gooseberry mildew.

Value of Sulphur against Potato Scab. — See above, No. 780. 857

France.
Germany

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

858 FRON, G. ***Dilophia graminis*** **injurious to Wheat in France.** (La maladie des épis de blé). — *Journal d'Agriculture pratique*, 76^{e} année, tome I, No. 11, pp. 340-342, fig. 55-56. Paris, 14 Mars 1912.

France

This disease was observed for the first time in France in 1882 on English wheat in the neighbourhood of Vitry-le-François. Since then it has been repeatedly noticed, especially in Seine Inférieure, Marne and Oise. Last harvest it was found near Château-Thierry, where most of the ears attacked were destroyed, and also in the departments of Aisne and Somme.

On examining samples of wheat sent from the neighbourhood of Château-Thierry, it was established that the ears are always attacked by the fungus first in the middle part; the latter gradually penetrating brings about the abortion of the ovary.

The samples examined belonged to the early wheat group. Great care should be taken to prevent the parasite attacking those varieties which are valued most, and which have been obtained from crossing. Whenever this fungus makes its appearance, all the diseased ears should be at once collected and burnt.

859 DALE, ELIZABETH. **A Bacterial Disease of Potato Leaves.** — *Annals of Botany*, Vol. XXVI, No. CI, pp. 133-154, Plates XV-XVI. London, January 1912.

Great Britain

The writer gives an account of a bacterial leaf disease due to *Bacillus tubifex* sp. nov., which attacks the leaves of the potato-plant by piercing the cuticle where it is thin enough for it to penetrate. The bacilli dissolve the middle lamella of the host-plant by means of a ferment and then pass between, or across, the cells of the host-plant by means of infection tubes. Infection generally takes place near the edge of the leaves, or along the veins either on the upper or lower surface.

It has, as a rule, little practical importance, for in a fairly hot dry summer, the cuticle of the potato leaves would generally be too thick, and the temperature too high, to allow of the penetration of the organism.

The disease has been most marked in plants grown in a cool greenhouse.

The bacteria have the power of causing fermentation, they are aerobic and anaerobic, and can live either as parasites or saprophytes. Spore formation readily occurs.

860 BRITTLEBANK, C. C. **A New Lucerne Trouble. Downy Mildew (*Peronospora Trifoliorum*, De Bary).** — *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. X, Part I, pp. 65-66. Melbourne, January 1912.

Australia: Victoria

The presence on lucerne of *Peronospora Trifoliorum* De Bary has been observed for the first time in Victoria. The oospores of the parasite have probably been imported into Victoria upon fragments of lucerne leaves occurring amongst the seeds of this plant.

861 CHITTENDEN, F. J. **On Some Plant Diseases, new to, or little known in, Great Britain.** (Contributions from the Wisley Laboratory XIV). — *Journal of the Royal Horticultural Society*, Vol. XXXVII, Part III, pp. 541-550. London, March 1912.

Great Britain

At the close of November 1911, the author found, for the first time, a fungus belonging to the genus *Marssonia* seriously affecting the leaves of some small lettuce plants (var. Early French Frame Forcing) which had been sent to him from a garden near Haslemere, Surrey. The fungus agreed in all its characters with a species described in 1896 on lettuce by Berlese and called by him *Marssonia Panattoniana*. The leaves attacked, finally decayed.

Another disease new to Great Britain was *Ramularia macrospora* Fres. found on the leaves of *Campanula persicifolia* from Old Colwall, Malvern, and which caused greenish-brown, circular, or sub-circular spots usually rather less than half an inch in diameter, and margined with purplish-brown, to appear on the parts attacked.

Under the name of " Streak Disease " the writer describes a serious disease affecting Sweet Peas (*Lathyrus odoratus*) to which during the past four or five years large numbers of these plants have succumbed.

By some writers, the disease has been attributed to physiological causes, others ascribed it to bacterial attack; occasionally, on long-dead specimens, a saprophytic fungus such as *Botrytis cinerea* was present. In many cases, *Thielavia basicola* was observed on the roots of the sweet-peas. The results of experiments, and of the inspection of various infected gardens, led Mr. Chittenden to conclude that any cause tending to the weakening of the root of *Lathyrus odoratus* predisposes it to the attacks of the fungus.

862 BUTLER, E. J. **The Rusts of Wild Vines in India.** — *Annales Mycologici*, Vol. X, No. 2, pp. 153-158, fig. 1. Berlin, April 1912.

British India

Two rusts are recorded on wild vines in India; one of these, occurring on *Vitis himalayana* Brand. (= *V. semicordata* Wallr., var. *Roylei* King), agrees in many of its chief characters with *Phakopsora Vitis*, first described by P. Sydow on plants of *V. inconstans* Mig. from Japan, and since found near Tokyo on *V. flexuosa* Thunb. The writer recently found it in great abundance on *V. himalayana* collected at Missoorie in the Western Himalayas.

The other rust has been found in India at Dacca and Rangpur on *V. latifolia*, and is a new species of *Chrysomyxa*, which the author names *C. Vitis*.

Experience has shown that all new parasites of the vine should be considered as sources of probable damage. *Phakopsora Vitis* is undoubtedly the more to be feared of the two; should it be found on cultivated vines in the Himalayas, it would be advisable for the vine-growing countries of Europe to take steps to prevent its introduction.

863 MONTEMARTINI, L. ***Hadrothricum Piri* on Pear Leaves.** (La macchiettatura delle foglie dei peri). — *Rivista di Patologia vegetale*, Anno VI, No. 14, 2 pp. Pavia, 1912.

Italy: Pavia

There are often seen on the leaves of pear trees little spots, light grey in colour, dry, shiny, roundish, more or less numerous, sometimes confluent, and with brownish edges. This disease is called *macchiettatura* by the Italians; by the Germans *Blattfleckenkrankheit* or *Weissfleckigkeit*. It may be due to various parasitic micromyceti, the commonest of which is *Septoria piricola* Desm., substituted sometimes by *Phyllosticta pirina* Sacc., by *Ascochyta piricola* Sacc., or by other species of these genera. To these should now be added a new species, as it seems, *Hadrothricum Piri*. This was discovered by the writer last autumn on the leaves of young pear trees at Montubeccaria (province of Pavia), and although very similar to, is yet distinct from, *Hadrothricum Populi* Sacc.

DAVIS, A. R. **The *Hendersonia* Disease of *Eucalyptus Globulus*.** — *Pomona College. Journal of Economic Botany*, Vol. II, No. 1, pp. 249-251, figg. 107-108. Claremont, Cal., February 1912. **864**

United States: California

As far back as 1909, Prof. Smith, pathologist of the State Experiment Station at Whittier, recorded a *Hendersonia* on *Eucalyptus Globulus*, but did not describe it fully. The writer has now found, in S. California, a *Hendersonia* parasitic on the same host plant, which he thinks to be the same fungus observed by Prof. Smith and others. The damage actually done by the parasite seems at present to be slight. It confines its attacks exclusively to the young broad leaves. Only in extreme cases of infection, do the leaves die and fall off. Infection probably takes place through the stomata on the under side of the leaf.

The writer proposes to call this apparently undescribed species *Hendersonia eucalypticola*.

WOLF, FRED A. **Some Fungus Diseases of the Prickly Pear (*Opuntia Lindheimeri* Engelm.).** — *Annales Mycologici*, Vol. X, No. 2, pp. 113-134, fig. 1-8, pl. I-III. Berlin, April 1912. **865**

United States: Texas

The researches undertaken during the last few years under the direction of the United States Department of Agriculture as to the use of prickly pears for fodder, make it important to study the diseases to which they are subject; in this article the writer gives detailed descriptions of three diseases of *Opuntia Lindheimeri* Engelm., common in the south-west of Texas. An anthracnose is produced by *Sphaerella Opuntiae* E. et E., conidial form *Gloeosporium limatum* E. et E.; black spot is produced by *Perisporium Wrightii* B. et C., and " sun scald " of cacti by *Hendersonia Opuntiae* E. et E.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

866 NOFFRAY, E. **Dodder and Bird's-foot Trefoil.** (La Cuscute et le Lotier corniculé). — *Journal d'Agriculture pratique.* 76e Année, 1912, tome I, No. 11, p. 339. Paris, 14 Mars 1912.

France

Bird's-foot Trefoil (*Lotus corniculatus*), either alone or mixed, is a plant which would well repay more extended cultivation. It is not, however, free from the attacks of dodder (1).

The writer has often found this parasite on the plant in question, when growing both in meadows and by the road-side.

867 SIRENA, S. ***Orobanche crenata*** **Forskal in Sicily.** (2). (*Orobanche crenata* Forskal e suoi danni in Sicilia). — *Bollettino del R. Orto botanico e Giardino Coloniale di Palermo,* Anno X, fasc. 1, 2, 3 (gennaio-settembre 1911), pp. 14-26. Palermo, 1911.

Italy

Orobanche crenata is very common in many places in the Mediterranean region. It extends from Spain and Morocco across southern Europe as far as Persia, and is very abundant in Italy and Greece; it also occurs often in Egypt and the Transcaucasus.

The plant lives as a parasite on the roots of *Vicia Faba* chiefly, but has been found on other Leguminosae amongst which are *Ervum Lens, Pisum sativum, Cicer arietinum, Trifolium* spp., *Lupinus* spp.; also on *Plantago albicans* and some Umbelliferae and Geraniaceae.

In Sicily, beans are extensively grown; they are used as green manure and also as an article of food by the people. Ground free from *Orobanche* lets and sells at a decidedly higher price than that which is infected by the parasite.

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(1) *Cuscuta Epithymum* has been observed by several writers as a parasite of *L. corniculatus*. See KIRCHNER-NEPPI: *Le malattie delle piante agrarie coltivate,* p. 189 (Torino, 1901); KIRCHNER, O: *Die Krankheiten und Beschädigungen unserer landwirtschaftlichen Kulturpflanzen,* 2 Aufl., S. 242 (Stuttgart, 1906); DELACROIX-MAUBLANC: *Maladies parasitaires des plantes cultivées,* p. 412 (Paris, 1909). (*Ed.*).

(2) See also *B.* Nov-Dec. 1911, No. 3250. (*Ed.*).

The remedies hitherto used against the latter consist in agricultural measures for freeing the bean fields from this enemy before the fructification of the latter and for planting the beans so that their roots do not reach the strata of soil most infected. Hitherto, however, no effective remedy has been suggested for the destruction of the seeds of *Orobanche* or their elimination from the soil.

Basing his experiment on the well-known fact that *Orobanche* seeds only germinate when in contact with the roots of their host plants, which appear to secrete special stimulating substances, the writer made some extracts and gelatine preparations of different concentrations from young bean plants and roots, with which he moistened the soil containing numerous seeds of the bean-rape. The gelatines were applied to land which had long been infected and on which bean-growing had been abandoned.

By means of the extracts, etc., the writer hoped to provoke a rapid germination of the *Orobanche* seeds followed naturally by the speedy death of the seedlings, which would find no bean roots to which to attach themselves. His object was attained, and subsequent crops of beans sown on the same ground developed normally, not a single *Orobanche* making its appearance.

The writer, while withholding the data of his later experiments on the subject, considers that the combating of *Orobanche* by means of its natural enemies is worth consideration. (1).

MUNERATI, O. and ZAPPAROLI, T. V. **The Effect of Alternations of Damp and Dryness on the Germination of Weed Seeds.** (L'influenza dall'alternanza dell'umidità e della siccità sulla germinazione dei semi delle erbe infestanti.). — *Malpighia*, Anno XXIV, fasc. IV, pp. 313-328. Catania, 1912. **968**

The researches of the writer show that the behaviour of weed seeds under alternating moisture and dryness is very different in different species.

Italy

In some species (*Vicia segetalis.*, *V. hirta*, *Convolvulus sepium*, *Galium Aparine*), the percentage of seeds which germinate in a given time is about the same whatever the variations in humidity may be; these seeds grow rapidly or very slowly, but always in a uniform manner.

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(1) See *B.* Nov. 1910, p. 169 and July 1911, No. 2315. (*Ed.*).

When the conditions of humidity and dryness alternate, the seeds of *Avena fatua, Daucus Carota, Myagrum perfoliatum, Capsella Bursa-pastoris*, and others acquire a rapidity of germination, which is not shown by seeds of the same batch, which have been kept in a constantly damp environment.

Other seeds show a very low germinating power in the presence of permanent damp, and a very high percentage when their environment is alternately damp and dry.

Thus, 8 to 10 % of the seeds of *Avena fatua* germinate in the space of a year, if placed in damp sand, and 75 to 80 % when the sand is kept damp and dry alternately. Seeds of *Capsella Bursa-pastoris, Rumex crispus, etc.*, will not germinate at all in a damp environment, even if they remain there for a long time; while they germinate with great rapidity as soon as the degree of humidity decreases, or if damp and dryness alternate. The normal conditions most favourable to speedy germination are, therefore, opposed to those required for the development of the embryo.

869 JAGUENAUD, G. **On the Use of Sulphuric Acid to destroy Weeds in Cereal Crops.** (Sur la destruction des mauvaises herbes dans les Céréales par l'acide sulfurique). — *Le Progrès agricole et viticole*, 29e année, No. 11, pp. 332-334. Montpellier, 17 Mars 1912.

France

The writer has made experiments in the district of Mirande upon the effect of sulphuric acid upon wild radish, charlock, crowfoot, vetches and vetchling. After about two days these plants were destroyed, while the wheat, far from being harmed, developed vigorously, as if the sulphuric acid had acted as a fertilizer.

The normal proportions with which the writer obtained the best results were 7 litres of sulphuric acid at 65° to 66° Beaumé per hl. of water, *i. e.* about 10 % in weight.

It is advisable to apply the remedy early in the spring by means of a watering-can or sprayer, and simple precautions must be taken against the caustic action of the acid. If a watering-can is used, a minimum quantity of 10 hl. per ha. (90 galls. per ac.) is necessary; with a sprayer, 7 to 8 hl. (60 to 70 galls.) are sufficient.

The cost in the first case, including labour, is 30 to 35 fr. per ha. (9*s* 6*d* to 11*s* per acre); in the second it amounts to about 26 fr. (8*s* per acre).

This treatment is equally suited to oats and barley, but for the latter rather less must be used.

INSECT PESTS

MEANS OF PREVENTION AND CONTROL.

FRENCH, C (Jun.). **Insectivorous Birds of Victoria. Frontal Shrike Tit (*Falcunculus frontalis* Gould).** — *The Journal of the Department of Agriculture of Victoria, Australia,* Vol. X, Part I, pp. 68-69, 1 fig. Melbourne, January 1912. **870**

Australia: Victoria

The Frontal Shrike Tit (*Falcunculus frontalis* Gould) is described as destroying a great number of injurious insects and as deserving of protection.

GASTINE, G. **Saponin in the Preparation of Insecticides and Fungicides** (1). (Sur l'emploi des saponines pour la préparation des emulsions insecticides et des liqueurs de traitements insecticides et anticryptogamiques). — *Le Progrès agricole et viticole,* 33ᵉ. Année, No 14, pp. 427-429. Montpellier, Avril 1912. **871**

France

In the destruction of insects by toxic sprays, the wetting power of the latter is a factor of great importance.

This can be obtained by means of the saponins which, in contradistinction to the alkaline soaps already suggested by Vermorel and Dantony, possess the property of not being decomposed or precipitated by liquids with an acid reaction or by metallic solutions; further, they are innocuous to plants.

A fair number of plants yield saponins; the fruit of *Sapindus utilis* contains over 50 % of a special saponin, which is very soluble, both in water and in alcohol.

From this, liquid insecticides and emulsions with great wetting-power can be obtained without the use of alcohol. The writer's researches show that 20 gr. of the powder of the *Sapindus* fruit in 10 litres of water are sufficient to form an emulsion with 700 gr. of coal tar oil; the emulsion obtained is very finely divided.

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(1) See *B.* March 1911, No. 1052. *(Ed.)*.

Copper salts may be added to coal tar oil emulsions without increasing the superficial tension.

The compound is therefore suitable for the destruction of naked scale-insects and aphides, and also of the fumago, which develops on the excretions of these insects.

The following is a copper emulsion formula:

Water	10 litres
Sapindus powder	20 gr
Neutral copper acetate	100 »
Mixture of heavy coal-tar oil and of petroleum with a density of 1.0	200 cc.

The property of wetting well is not only necessary to insecticides, which work by contact, but is also very useful in the case of insecticides and fungicides which are intended to impregnate the leaves, since wetting increases the power of adherence by promoting, in the case of soluble products, the penetration of the active agents (*e.g.* copper) into the cuticle of the leaf, while in that of insoluble bodies (lead or copper arsenate) it causes, by means of capillarity, a more complete and lasting adherence.

INSECTS INJURIOUS TO VARIOUS CROPS.

872 SCOFIELD, C. S. **The Nematode Gallworm *(Heterodera radicicola)* on Potatoes and Other Crop Plants in Nevada** (1). — *U. S. Department of Agriculture. Bureau of Plant Industry. Circ.* No. 91, 15 pp., 21 figg. Washington, Feb. 20, 1912.

United States: Nevada

During 1910 and 1911 certain irrigated potato-growing districts of Nevada were so severely attacked by *Heterodera radicicola* — locally known as the eelworm disease — that a quarantine was established against all potatoes shipped into California from those districts. Besides potatoes other crop plants are affected.

The use of any infected potatoes as seed must be strongly condemned, and all infested fields should be carefully isolated, and devoted to crops which the nematode does not attack.

Its numbers may be so reduced by planting immune crops that after a time susceptible crops may be grown again without serious injury.

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(1) See *B.* March 1912, No. 587. *(Ed.).*

HEROLD WERNER. **Dascillus cervinus L. injurious to Moorland.** (*Dascillus cervinus* L. als Moorwiesenschädling). — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*: II. Abt., Bd. 33, Nos. 17-19; pp. 438-442, 6 Textfig., 1 Tafel. Jena, 23 März 1912. 873

Germany

In October 1911 the phytopathological section of the Kaiser Wilhelm Institute in Bromberg received from South Posen some larvae of an insect which was identified as *Dascillus cervinus* L. It had destroyed the vegetation over a large extent of moorland, consisting of dry peat; it lies so high that even in winter and spring it is usually only partly under water. The highest parts had been attacked most. It is to be feared that *Dascillus cervinus* will work damage in other parts of Germany, as, so far, no satisfactory remedy has been found.

NOEL, PAUL. **The Parasites of the Begonia.** (Les ennemis du Bégonia). — *Bulletin du Laboratoire régional d'Entomologie agricole*, 2ème trimestre 1912. (Avril-Mai-Juin), p. 13. Rouen, 1912. 874

France

The writer mentions the following parasites of the begonia: an undetermined yellowish white insect; *Tarsonemus* sp.; *Heterodera radicicola* Greff.; *Aphelenchus olesistus* Ritz.; *Bacillus caulivorus* Prill., and *Botrytis cinerea* Pers.

FRENCH, C. (Jun.). **The Light Brown Apple Moth.** [***Tortrix* (*Cacoecia*) *responsana***]. — *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. X, Part 2, pp. 111-113, 1 fig. Melbourne, February 1912. 875

Australia: Victoria

The writer received from Mildura, last October, some specimens of young bunches of "Zante Currant Grapes" (*Vitis vinifera* var. *apyrena*) which had been much damaged by an insect, which he recognized as being the larva of *Tortrix* (*Cacoecia*) *responsana*, the Light Brown Apple Moth.

This insect, which attacks many cultivated plants, amongst them apple, had already been met with in different parts of the State of Victoria. In the chrysalis condition, it has many natural enemies, but the best remedy for it is arsenate of lead, if it penetrates well into the bunch where the parasite conceals itself.

Lamp traps, with a vessel of kerosene, are equally efficacious. It is well to commence operations as soon as ever the insect is observed.

876 LESNE, P. **Insect Pests of Poplars and Willows.** (Les insectes des Peupliers et des Saules). — *Journal d'Agriculture pratique*, 76e Année, Tome I, No. 14, pp. 433-439, fig. 68-74, 1 pl. en coul. Paris, 4 Avril 1912.

France This is a description of the insects most harmful to poplar and willows. There are two chief classes: a) those which damage the wood; b) those which attack the foliage.

To class a) belong:

Cryptorrhynchus lapathi (1) on willows and poplars, *Saperda carcharias* and *Saperda populnea* on poplars and aspen, *Lamia textor* and *Aromia moschata* on willows, *Sesia apiformis* on poplars, aspen and willows.

The remedies are: the collection of the adults, the use of capsules of carbon bisulphide to be placed in the passages hollowed out by the larvae, the application of a mixture of clay and cow's dung to the base of the trunk, the burning of the infected parts in serious cases.

To class b) belong:

Melasoma populi, *M. tremulae* on poplars and willows, *Phyllodecta vitellinae*, *P. vulgatissima*, *Plagiodera versicolora*, Laich. *Galerucella lineola*, [illegible] on willows, [illegible] (puss moth) on poplars and willows, *Lithocolletis populifoliella* on poplar.

Remedies: collection and destruction of the insects and the use of various insecticides.

Insects of less importance are:

Nematus gallicola, *Pemphigus bursarius* and *P. spirothecae*. Galls are produced by all three, on willow leaves by the first, on the petioles, the leaf-edges, and the young branches of poplars by the second and third.

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(1) See *I.* Aug.-Sept.-Oct. 1911, No. [illegible]

INTERNATIONAL INSTITUTE OF AGRICULTURE

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The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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AGRICULTURAL INTELLIGENCE

NB. The Intelligence contained in the present Bulletin has been taken exclusively from the periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of April and May 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

871 **Legislative Measures in Uruguay on Live Stock Shows.** (Ley y Decreto Reglamentario sobre distribución de subsidios oficiales para premios en las exposiciones-ferias de ganaderia). — *Comunicación del Ministerio de Industria del Uruguay.* Montevideo, 1912.

The Senate and the Chamber of Deputies of Uruguay have allotted in the Budget 50000 pesos (£10 625) for prizes to be awarded at live stock shows and fairs.

As annex to the law, a decree sets forth as follows the regulations for the granting of prizes and subsidies.

Uruguay

Subventions will be granted to associations that promote live stock shows, according to the information furnished by competent authorities on the results of the preceding show held by the same association.

The subsidies will not be granted to private persons.

Prizes will be given especially for the encouragement of the breeding of the following classes of stock, after due consideration of the conditions of the region in which the exhibition will be held:

Breeding animals of milk breeds.
Deep milking cows.
Breeding pigs.
Fat swine.
Steers fattened in pastures and on leas.
Sheep fattened as above.

Cattle bred in the open.

Heavy draught horses.

Creole horses improved by selection.

There will be prizes also for dairy produce, and for those farms that have the greatest extent of seed-leas.

The associations must provide at the show a weighbridge for stock, and a place for measuring animals according to Lydtins' method. They may hold milk and wool exhibitions and promote lectures on national stock raising.

878 Development of Agriculture in Hungary : Work done by Ministry of Agriculture (1). — *A M. kir. kormány 1910 évi müködéséröl és az orszag közállapotairól szóló jelentés.* (Extract from Report of Hungarian Government on the work done in 1910).

Hungary

1. *Horticulture and Fruit growing.* — In order to favour their development the Ministry has instituted, besides the Royal national school of gardeners: 1. a three years' course for gardeners who intend managing large horticultural exploitations ; 2. a two years' course for assistant gardeners ; 3. a two years' course for gardeners' workmen ; 4. a course of horticulture with model garden for the pupils of intermediate schools and schools for adults.

There is a fruit-growing experiment station at Tyeij and a station for the protection of fruit at Nagybánya for practical experiments on the destruction of animal and other pests attacking fruit. Besides, in 1910, state garden experts visited upwards of 100 communes, in which they held lectures, examined nurseries, directed the installation of fruit-drying plant, introduced machines for the manipulation of fruit, taught the use of cider mills, jam machines and distilling apparatus. The Ministry distributed 202 486 fruit-tree cuttings, 1 364 300 seedlings, 59 540 ornamental trees and shrubs, 53 520 scions. The cuttings sold by the State at cost price were upwards of 300 000. Along the State roads 27 000 six-foot trees have been planted, bringing up their total to 220 465. Prizes have been awarded to the best kept nurseries. Large numbers of vigorous fruit trees of inferior quality have been regrafted, and, for the purpose of increasing and improving the quality of various fruits, delegates have been sent abroad for the purchase of choice varieties, *e. g.* to France far walnuts, to Jena for hazelnuts.

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(1) See *B.* May 1912 No. 764. *(Ed.)*.

In order to favour the production of good melons the Ministry has given superior quality seeds, taking in exchange an equal weight of seeds of inferior quality.

In order to facilitate the exportation of Hungarian fruits, the Ministry has instructed the consuls abroad to send information on the production of each country.

2. *Stock and poultry breeding.* — For the improvement of stock the 43 State inspectors heve attended to the distribution of breeding animals, the number of which has been considerably increased. The Ministry has given gratis or at reduced prices : 1668 Hungarian, 2876 Bonyhád, 876 Pinzgau bulls and 134 bulls of the gray breed, besides 28 buffaloes. For pig-breeding, 4172 Mangalicza boars and 474 of a breed for fattening have been distributed. 277 rams and 35 milk ewes have been distributed, as well as 1200 breeding rabbits (with the object of developing among the people the consumption of the cheap flesh of rabbits). Poultry shows have also been held and have contributed to the improvement of poultry.

3. *Dairies.* — There are now 555 cooperative dairies at work. The State grants them subventions on condition that the skimmed milk that they sell be previously boiled so as to prevent the spread of diseases due to the germs that it might contain. A great deal has been done for mountain dairies: sheds, refuges, shepherds' huts and roads, for a total of £1135, 6*s* 8*d*.

4. *Meadows and Pastures.* — In 1910 the Ministry has promoted the improvement of 27 620 acres of meadows, both by the introduction of new seeds and by artificials. It has spent on the improvement of meadows £7187, 16*s* 8*d*, and has supported 20 to 40 % of the cost of purchasing new meadows in 17 communes.

5. *Horse-breeding.* — There are in Hungary 4 stud farms : Szekesfehérvár with 260 service stations, Debreczen with 273, Nagykörös with 263 and Szepsiszentgyörgy with 106. Altogether 902 stations with 3040 stallions, besides 194 stallions let to as many owners. The station stallions covered 132 753 mares, bringing in £38 464, 3*s* 4*d*. The hired stallions covered 6212 mares.

At the end of 1910 these four State stud farms contained 4037 head, of which 1004 were brood mares.

The State stallion depots of Kisbér, Bábolna, Mezöhegyes and Fogarás contained a total of 4127 head : 703 at Kisbér, 796 at Bábolna, 2212 at Mezöhegyes and 416 at Fogarás.

For the diffusion in the country of English thoroughbreds the 18 stallions at Kisbér covered 245 mares belonging to private persons, bringing in £7191, 13*s* 4*d*. The sale of surplus and discarded stallions produced £3935, 19*s* 2*d*. The four State stud farms gave 265 stallions to the various depots for the price of £19 700.

6. *Silkworm-rearing.* — The number of communes and hamlets in which silkworms are reared has increased in 1910 by 436. The necessary mulberry trees have been planted by the Inspectors of national silkworm breeding.

In 1909 there were 79 861 families that reared silkworms; in 1910 they were 90 064. The average earning per family in 34 communes was above £4,3*s* 4*d* each, but the average earnings of all the communes in 1909 reached only £1,17*s* 9*d*. The total earnings of the women employed in the silk-spinning and silk-twisting industry increased by £4166.

In consequence of the increase in the production of cocoons, it has been found necessary to establish two new spinning mills and one twisting mill. The Törökkanizsa spinning mill had 80 spindles and the Békéscsaba 120. At the Tolna twisting mill a comfortable home has been founded for the workwomen, with a view to having a constant supply of skilled and disciplined labour. The average monthly earnings of the mill-girls is £1,5*s* to £1,13*s* 4*d* of which they can save 12*s* 6*d* a month.

7. *Beekeeping.* — The Ministry is endeavouring to promote bee-keeping by organising courses and lectures to train experts.

In the State bee-keeping station at Gödöllö as at Kalocsa, Koloszvár and Maros-Vásárhely in the 1910 six-months course, practical bee-keeping was taught to 300 persons, of whom 80 were farmers, 20 priests, 180 elementary school masters and 20 veterinary students. The special professors of apiculture held 241 lectures, namely 200 in the communes and 5 in agricultural, 9 in normal and 27 in other schools. The Ministry granted in 1910 to 42 bee-keepers, £318,15*s* 10*d* for implements and for swarms. Besides which £383,6*s* 8*d* were distributed to bee-keepers' associations, and the bee-keeping station has distributed to 450 bee-keepers the seeds of honey-producing plants.

8. *Fish-breeding.* — For the development of fish-breeding the Ministry has adopted the following measures: In order to restock the waters of the Theiss and some ponds the Ministry distributed in 1910 590 cwt. of carp fry, and has thus methodically restocked 4260 acres of water. Four associations have been founded in the course of the year for the improvement of the State waters: at Alsóungvidék, Hunyadmegye, Somogymegye and Alsópoprád, over an area of 8904 acres. At the end of the year there were 74 fishery associations which had organised fish breeding in State waters over a total area of 385 685 acres. The work done by these associations

has so considerably improved the conditions of the neighbouring lands that in some instances the rent has increased by 100 per cent.

The Ministry gave in 1910 to land owners and farmers 64 ½ millions of Fogas pike-perch eggs, $2^3/_4$ millions of common trout eggs, $1^3/_4$ millions of rainbow trout eggs; 700 000 fry of carp and of shad; 70 000 breeding crayfish and 33 couples of carp. The actual number of cultures is 76 in ponds furnished with sluices, and 69 in ponds without sluices, the former covering an area of 13051 acres, the latter 6597 acres.

9. *Game.* — The Ministry has subventioned 30 game associations and has besides distributed to them a considerable number of pheasants. It has granted £159,11*s* 8*d* as rewards for the destruction of birds of prey. A shooting reserve has been placed at the disposal of forest employés.

10. *Higher Veterinary School at Budapest. Section of animal hygiene.* — The bacteriological Institute of this School has created a section for the culture of serums, which began operations on November 1, with the preparations of serum against swine fever, gangrene, etc. The meat control has been entrusted to persons who are not veterinaries, provided they have the training according to the law of 1908.

11. *Veterinary service.* — In 1910 there was a total of 640 State Veterinaries.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

LEPLAE, EDMOND. **Katanga, its Agriculture and Colonisation** (1). (Mission Agricole au Katanga. Aperçu Général: Rapport sur les Travaux de la Mission Agricole et sur la Colonisation Agricole). — *Bulletin Agricole du Congo Belge,* Vol. III, No. 1, pp. 1-58. Bruxelles, mars 1912. **879**

Belgian Congo

At the present time in Katanga there are only five or six European estates, and the part of them actually cultivated is extremely limited. Consequently the food for the population of Elisabethville, the mining centres and the caravans is supplied by Rhodesia, which sends cereals, cattle, vegetables, fruit, etc. Several years and rapid development of agricultural colonisation will be required in order to enable the importation from Rhodesia to be replaced by local production. On the whole the establishment of agricultural colonisation in the zone of the Katanga Copper Mines presents no real difficulties, provided that in carrying it out the method adopted of colonisation by villages, a system presenting every guarantee of success, is persistently adhered to. Simultaneously with the importation of European colonists, cultivation among the natives must be developed by distributing seed and small cattle. Agriculture should be made to penetrate little by little into the regions more remote from the railway, increasing every year the extent of colonial roads.

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(1) See *B.* Aug.-Sept.- 1911, No. 2420. (*Ed.*).

The soils in the colonisable regions are slightly undulated, clayey and deep. Irrigation is possible almost everywhere. The whole of this region is to-day an immense forest, and almost the entire zone to be cultivated must be cleared by means of steam appliances. A large number of woody valleys present lands for kitchen gardens and pasture which can be immediately utilised.

The conditions of soil and climate admit of all the crops of Western and Southern Europe: cereals, green crops, vegetables and fruit trees, and allow of rearing small live-stock and poultry.

The gradual disappearance of the tsetse fly together with the clearing of the forests will promote likwise the breeding of horses and oxen.

The agricultural station of Welgelegen concerns itself specially with the control of the tsetse fly and also grows green crops. The colonisable region of the southern end of Katanga is a country of small farms. Large farming is possible on condition that it is done mechanically, but heavy expenses for clearing the forest will form an obstacle to its development until the railway has reached the central plateaus of Katanga, where vast extents of land covered with grasses are found, possessing great fertility.

The natives in the south-east of Katanga already grow satisfactory crops, principally sorghum, maize, sweet potatoes, manioc, castor oil and tobacco.

Katanga possesses in its subsoil abundance of water both for dvinking and irrigation purposes.

Forest investigation, and in particular the propagation and utilisation of the best native species and the introduction of foreign species, present great interest for Katanga. In point of fact the forest only produces firewood; trees with a regular and healthy trunk form almost an exception; their wood is heavy, hard to work and liable to warp when dried. Native timber is very little used for building purposes. For the purpose of studying the wood of the country and making experiments in connection with the introduction of forest species and varieties, seed beds and nurseries have been established at Elisabethville and on the estate of La Chasse. The experiments of acclimatisation are made in particular with various conifers and eucalypts which thrive exceedingly with irrigation throughout South Africa. The distillation of the wood has a great future before it in the woody regions of South-East Katanga.

EDUCATION IN AGRICULTURE AND FORESTRY — AGRICULTURAL EXPERIMENTATION.

The Relation of Rural Economics to Farm Management. (Report of the Committee on Instruction in Agriculture, 1911). — *U. S. Dept. of Agric., Office of Experiment Stations, Circular* 115. Washington, January 29, 1912. **880**

United States

During the past year the Committee of Instruction in Agriculture of the United States has made studies along two lines: (1) the relation of rural economics to farm management and (2) the grouping of studies in college courses in agriculture. Reports on both of these subjects are submitted in this Bulletin. Brief mention is also made of the work of the committee relating to home economics.

The conclusion reached by the Committee, is that a line of cleavage should be determined between the course of study which deals with the economic problems in agriculture and the courses of study known at present as agronomy, horticulture, animal husbandry, dairying, and rural engineering and that there are two classes of subject matter in the field of economics.

One of these deals with the farm as a unit, the other with the community as a unit. When differentiated, the course on the first class of problems has been usually called farm management; the second has perhaps always been called rural economy, or economics, or agricultural economics, unless further subdivision has taken place. The subject taught or investigated under the head of farm management, as related to the organization and management of individual estates devoted to agriculture, in the judgment of the

Committee necessarily involves the application of the principles of economics.

These principles constitute the scientific basis of farm management and give this subject its only just claim for consideration as having a pedagogical value entitling it to a place in courses of study, or a scientific standing as related to problems of investigation. It is true that the farm manager should take into account what is taught under agronomy, animal husbandry, agrotechny and rural engineering, but he is chiefly and essentially concerned with the application of economic principles to the conduct of his business. Outside of economics there is nothing which can give his business a sound scientific basis. The mere collection of the details of methods of conducting different farms will not suffice. There must be the reference of these matters to some underlying principles.

The ideal to be desired is for the teacher and investigator to bring to the economics of agriculture the training and point of view of both the economist and the agriculturist.

It seems desirable therefore to use the term *rural economics* as applicable to the general field of economics in its relation to agriculture and rural communities; the term *farm management* may properly be restricted to that phase of rural economics which deals with the business organization and direction of individual farm enterprises, or in other words, deals with the farm as a unit.

Rural economics is preferable to agricultural economics because the former term indicates that the affairs of the community, as well as of the individual farmer, are to be considered under this head. There does not seem to be any single term under which are grouped the community phases of rural economics, as distinguished from those relating to the individual estates.

But besides the more general courses in rural economics, there will undoubtedly be an increasing number of courses treating of various subdivisons of this subject, in addition to farm management. Such, for example, would be courses in farm accounting, cooperation and credit, farm labor, markets and marketing, taxation, etc.

There is another group of rural problems which is quite clearly differentiated from rural economics, and forms a branch of social science or sociology, to which the name of rural sociology may be appropriately applied. Rural law and legislation, history of agriculture, and comparative agriculture, are also subjects more or less distinct and separate. For the present, however, it may be desirable to put such subjects in some other department in order that some attention may be given them in the scheme of college courses in agriculture. As the resources of the agricultural colleges increase and trained specialists along these lines are available, separate chairs should be established to represent these important subjects.

Agricultural Education in India. *Report on the Progress of Agriculture in India for 1911.* Calcutta, 1912. 881

When the Provincial Agricultural Colleges and that of Pusa were founded, it was intended that students who had completed their course at a Provincial College would continue their studies at Pusa, but owing to the limited demand for agricultural scientists in India, the number of such post-graduate students at Pusa is very small. Meanwhile the short practical courses in subjects which are not at present taught in the Provincial Colleges continue to be attended by a good number of students.

British India

The main College buildings at Poona have been completed and of the 104 students at the end of the last College year, nine-tenths intended to take the agricultural degree of the Bombay University.

The vernacular Agricultural School opened in Poona is considered to be a success, and it is intended to start similar schools in the Southern Maratha Country, Sind, and Gujarat.

At the Madras Agricultural College at Coimbatore fourteen out of sixteen students obtained the diploma; about half are the sons of land-owners, who will use their knowledge on their own estates.

A feature in agricultural education in the Central Provinces is the development of the training of *Kamdars.* Men who are literate in the vernacular and thoroughly understand the respective branches of agriculture on which they are to be employed, are trained in special methods of cultivation that have been demonstrated as successful in the area in which they live, and are found capable of doing very useful work under the agricultural assistants. The training classes at Raipur and Hoshangabad are becoming increasingly popular, and meet a genuine demand from private estates for trained employés.

The College at Sabour in Behar was opened in 1910, and the Agricultural College at Cawnpur has been recently formally opened. The Punjab Agricultural College at Lyallpur was opened in December 1910 and in Burma a scheme has been prepared for the creation of a staff of district vernacular agriculturists, to serve as intermediaries between the Agricultural Department and the Co-operative Societies and general public.

A perusal of the reports of the Provincial Departments leads inevitably to the conclusion that while the Agricultural Colleges are patronised to a large extent by candidates for Government employment, the number of agriculturists who value a scientific education as a preparation for an independent career for their sons is very small. On the other hand, there is undoubtedly already a large demand on behalf of both the Agricultural Departments and land-owners for vernacular speaking and writing agriculturists who have received what may be called a purely technical training in agriculture, and it is the experimental farms that must provide the basis of all such instruction, by evolving the methods to be taught.

The uselessness of attempting to teach agriculture as such in primary and secondary schools is acknowledged, but there is an almost universal feeling that the present instruction in rural, primary and secondary schools could be very much improved, by the inclusion, for example, in the curricula of secondary schools, as compulsory subjects, of certain of the sciences which deal with the principles underlying the practice of agriculture.

The gap in the scheme of education which now exists and renders the ordinary student unprepared to enter an Agricultural College would thus be filled up.

882 **Instruction in Grape-growing and Wine-making in Hungary.** — *A. M. kir. kormány 1910 évi müködéséröl és az ország kozállapotairól szóló jelentés.* (Extract from Report of Hungarian Government on the work done in 1910).

The Hungarian Ministry of Agriculture continues to spread instruction in grape-growing and wine-making, by means of the courses and meetings organised some years ago.

Hungary The number of meetings lasting 1 to 3 days for lectures held in 1910 by the Royal inspector of grape-growing and wine-making, in the communes interested in the production of wine, was 946, and they were attended by 39435 small land owners and vineyard hands.

There were also courses lasting two to four weeks for school teachers, priests, landowners and vineyard hands, and special courses for day labourers in those localities in which the State owns vineyards.

The *State Schools for Vine-dressers*, a *Preparatory School for Cellar Foremen* at Budafók, a *Higher Course of Vine-Growing and Wine-Making* at Budapest, the *Central Vine-Growing Experiment Station* and the *Ampelological Institute* of Budapest have, during 1910, displayed their usual activity. The Ministry of Agriculture has besides published a number of works, instructions and leaflets. The *Central Vine-growing Experiment Station* and the *Ampelological Institute,* as well as the *Higher Course of Vine-Growing and Wine-making* of Budapest, are also entrusted with collaboration in the spread of special knowledge, by means of scientific experiments.

In 1910, 157 pupils followed the courses in 8 *Royal Schools for Vine-dressers.* At the *Preparatory School for Cellar foremen* at Budafok, 14 pupils obtained their diploma at the end of 1909-1910. Since the organisation of the school, 137 persons have been awarded diplomas. Besides, this school has organised:

1. A fourteen-days' course for large landowners and agricultural employés, which was attended by 28 persons.
2. A fourteen days' course for small landowners and vine-dressers, attended by 24 persons.

The courses were free of charge during January and February.

3. Two courses for priests and teachers during the summer vacation on the treatment of wines. These courses lasted two weeks and were attended by 38 persons.
4. The pupils of the higher course of vine-growing and wine-making were occupied for a month in the cellars of the school in order to learn the systematic practical treatment of wines.
5. The third-year pupils of the Horticultural Institute received during the winter months a course of practical instruction given on one afternoon each week.

The School director's office answers queries addressed by landowners on subjects connected with the treatment of wines; it lets out its pasteurisation apparatus and allows the cellar foremen attached to the school to assist landowners who apply for their services.

The school has awakened general interest and in 1910 upwards of 2000 persons have visited its cellars, its collections, and its chemical, geological and botanical laboratories.

The *District Inspectorships of Vine-growing and Wine-making* have also exerted much influence on the spread of scientific vine-growing. Besides lectures and the above-mentioned courses, the inspectors have visited almost all the vineyards, giving information and advice to all who applied for them.

The *Central Vine-growing Experiment Station* has dealt especially with the improvement of wine-growing and of its yield, from a scientific point of view.

It has improved its plant and during the year 1910 it has been provided with all the apparatus and instruments required for its scientific experiments.

Among its research work, analyses of the remedies, recently offered to the public for the control of vine diseases, and communications on their value and best mode of usage are to be mentioned. It has also conducted tests on the value of new machines and implements used in viticulture. The Institute has also dealt with the question of the manuring of vineyards and of the results of various manures on the quantity and quality of the crop. It has organised some experiments, which will extend over several years, on the most favourable season for pruning vines according to different methods; and others on the best means of increasing the duration of vine supports. The Institute has always acted in harmony with the other organisations dealing with the same subjects, and has communicated the results obtained to all those interested in them. It has published instructions which it has spread in thousands of copies.

For the protection of the vineyards which have been reconstituted and kept up at considerable cost, and of the trade in pure wines, the Ministry has provided for the stringent enforcement of the Law XLVII of 1908, which contains severe measures against the adulteration of wines.

The control commissions of the wine-growing centres, and the special employés of the Ministry, together with the competent magistrates, visited in 1910 numerous cellars and other premises for the preparation and storage of wines and took 372 samples of wine belonging to 165 owners.

The analyses of these samples were made by the special commissions of Budapest and Kolozsvár, who found 67 samples belonging to 43 owners (that is 18 % of the samples belonging to 26 % of the owners) not in accordance with the requirements of the law.

888 ROUGET, M. F. **The Belgian Congo Museum at Tervueren.** (Le Musée du Congo belge à Tervueren). — *Bulletin de l'Office Colonial*, No. 51, pp. 67-75. Melun, mars 1912.

Belgian Congo

Two important principles are kept in mind in the organisation of the Belgian Congo Museum at Tervueren. In order to prevent over-crowding and confusion, typical specimens only are chosen, and in this way, every object is well seen. On the other hand, as far as possible, the complete evolution of each specimen is shown from the raw state to the completed product.

In the case of an economic product, the fruit, flower and leaves and the process of manufacture and practical application are also shown.

The museum is divided into five sections: Economic Science, Moral and Political Science, Natural Science: Ethnography, Photography and Popular Education.

The first is devoted mostly to exports and imports.

The exhibits under the former head consist chiefly of rubber, ivory, copal, cocoa-nuts and palm oil, and are so arranged that any one can quickly find the product in which he is interested. Vegetable products which come from other tropical countries, and have been recently introduced into the Congo (cotton, rice, edible fruits, and textile, oleaginous, medicinal and industrial plants) and the substances obtained from the rocks, have a printed label attached bearing a short account of their history and economic use.

A special room is devoted to rubber. Rubber trees from the Congo show the rational method of tapping to obtain the latex. Beside these are displayed specimens of latex, flowers and leaves. The portions of rubber-producing plants which are attacked by parasites, are exhibited in special cases.

On the walls of the room are pictures of lianes and of the substances obtained from them by the natives by means of tapping. Specimens of cultivated rubber are also to be seen. The natural history exhibits are disposed so as to at once give the impression of the richness of the soil, rocks and fauna of the Congo.

There are special cases of the most interesting mammals, birds, fishes and insects which occur in that country.

The character of the museum is both scientific and practical. It gives a continuous picture of the energy displayed in the Congo by Belgium at the present time, suggests ideas or disseminates knowledge on subjects at present little known; it also constitutes a living and active educational centre, which is destined to instruct the people and awake the intellectual power still latent amongst them.

AGRICULTURAL INSTITUTIONS.

884 **Organisation of the Algeria Office in Paris.** (Rapport sur le Fonctionnement de l'Office de l'Algérie). — *Supplément au No. 7 du Bulletin de l'Office du Gouvernement Général de l'Algérie,* Année 1912, pp. 99-133. Paris.

Algeria possesses in Paris an office for information and propaganda, the official mission of which is: To reply to enquiries from all persons interested in the Colony; to concern itself with immigration and to gather all such agricultural and commercial information as may be of interest to producers and traders in Algeria.

Algeria

The Office undertakes the presentation of the produce of the Colony at agricultural shows and exhibitions and is required to answer the very many questions put by visitors. It undertakes the receipt of produce on its arrival in Paris and attends to its actual installation in the rooms of an agricultural show for all such exhibitors as have no agent of their own. For official colonisation the Paris office examines and reports on applications for gratuitous concessions and circulates official documents published on colonisation. The Office also acts in the regulation of free immigration. In order to attract rich agriculturists the Office advertises the sales and lettings of private estates.

Agricultural and commercial information constitutes the most important part of the duties of the Office. The latter keeps constantly posted up in regard to agricultural shows held and results obtained with new systems in France and abroad. It centralises the agricultural information reaching it from any country the agriculture of which may present useful data for Algerian farmers, or the consumption in which may be of interest to Algerian producers. It has made special study of the development of grape-growing and wine-making abroad (taking note of the systems of controlling phylloxera), cereal growing, in particular barley, new systems of motor farming, and the cultivation of and trade in fruits and vegetables. Cotton, oil, and cattle-breeding have also been the subject matter of study aimed at meeting Algerian requirements.

All the great markets of the world which can receive the products of the Colony have been studied. Thanks to this Office, Algeria took part very advantageously and with great credit in the general agricultural show held in Paris in 1911, and in the International Exhibition at Roubaix.

AGRICULTURAL SHOWS AND CONGRESSES.

The Orchard Competitions in the Canton of Vaud (Switzerland). Report of the Judges for 1912. (Les Concours de Vergers dans le Canton de Vaud, Suisse. Rapport du Jury pour 1912). — *La Terre Vaudoise*, 4^e Année, No. 14. Lausanne, 6 avril 1912. 885

At the beginning of March 1912, the judges visited 33 registered orchards; the competitors all received commendation, the total of marks varying from 23 to 39.5. The healthy condition of the trees and the general appearance of the whole orchards left nothing to be desired.

The judges made the following remarks:

The making of orchards in the country was, at first, a question chiefly of supply the orchard being an addition to the household Switzerland economy of the farmer, who used the fruit in various ways. If the crop permitted, the surplus was sold. For this reason, every farm had its orchard made, either from wild trees taken from the forest or the hedges and subsequently grafted, or from trees obtained directly from the nursery, the latter course being the one usually followed now-a-days.

The method of planting wild stock, though it still finds favour with some growers, should be abandoned as giving too many failures. Every year these home orchards increased in size from the admission of new wild stocks or grafted trees furnished by nurserymen, or sometimes by hawkers. Hence arose the numerous kinds, often of doubtful value, which are found in old orchards. Today the situation has changed, new methods tending to be adopted in fruit culture. The fruit being of better quality is much in requisition.

Further, planting has often, though not always, been carried out in regular lines with sufficient space between them. In numerous districts, an attempt has been made to correct the defects of the old orchard by introducing young trees. Then, although the crops were good, it was sometimes difficult to dispose of the produce, as the fruit did not satisfy the requirements of the trade, which itself had undergone changes and become organized. For reasons of transport, appearance and preservation preference was given to certain varieties, which had an established reputation.

Therefore, the grower who formerly only aimed at planting or enlarging an orchard, is now obliged, in the first place, to consider the purpose to which he wishes to apply it. If it is for his personal use, he can choose such varieties as seem best to him, but if he has an eye to the market, he will do well to plant such trees as yield the fruit preferred by the dealers or by his own customers.

The judges mention certain improvements which should be made:

1. *More care should be given to the trees.* — Thinning should be practised upon the small branches, rather than upon the large ones only, as the latter system makes a gap in the canopy instead of letting in light evenly. Many and too long props injure the crown, giving rise to canker; further, for want of proper tying the tree is often left without support. The practice of scraping and then liming the trunk and large branches should become general. Autumn planting is to be preferred, as trees put in at this season get a much better hold.

2. *Useless varieties should be eliminated, or regrafted.*

3. *Socalled "commercial" varieties should be propagated.* — The following varieties, which are recommended by the Vaudois Society of Pomology, have everywhere a ready sale:

Early apples: Charlamonsky, Astrakan rouge, Alexandre, Transparentes de Croncels and Gravenstein.

Late apples: Cuisinière (or Citron d'hiver), Bovard, Reine des Reinettes, Ribston Pippin, Jacob Lebel, Reinette de Caux, Reinette Baumann, Reinette du Canada (only in certain districts with a good climate).

4. *The orchards should be better situated.* — A sheltered position should be chosen more often than is done at present, and buildings, woods, elevations, etc., should be utilized as wind-breaks to protect the trees from the violence of the winds, and from spring showers, which destroy the blossom.

886 **Mechanical Ploughing Competition.** (Concours de labourage mechanique). — *Journal d'agriculture pratique*, 76e Année, No. 14, pp. 426. Paris, 4 avril 1912.

France

The French Automobile Club has organised a mechanical ploughing competition to be held at Bourges on the first three days of October 1912. The machines will be classed as follows:

1st and 2nd classes: Traction engines (price below 15 000 fr., (about £600), and price above 15 000 frs.).

3rd and 4th classes: Ploughing machines (price below 15 000 frs. and price above 15 000 frs.).

5th and 6th classes: Mixed traction engines, with drum (price below 15 000 frs. and price above 15 000 frs.).

7th and 8th classes: Steam outfit (price below 15 000 frs. and price above 15 000 frs.).

9th class: Electric outfit.

Competitors will be allowed a fixed indemnity and prizes variable in amount for each of the following points:

1. Extent of area ploughed.
2. Cost per acre, labour included.
3. Facility of operating.
4. Regularity of work.
5. Use of petroleum.
6. Deep ploughing (10 to 12 inches): this is a special and *optional* test.

National Live-stock Show at Montevideo, Uruguay, in August 1912. (Exposición N. de Ganadería). — *Comunicación de la Asociación Rural del Uruguay*. Montevideo, 1912. 887

The "Asociación Rural del Uruguay" communicates that a live stock show will be held at Montevideo in August 1912.

Uruguay

The exhibition will include the following classes:

A) Stall-bred cattle for breeding purposes.

I. Entered in the Uruguayan Herd Book.

Class	1	Bulls of various ages
»	2	
»	3	
»	4	
»	5	
»	6	
»	7	Cows » »
»	8	
»	9	
»	10	Heifers.

II. Not entered in the Uruguayan Herd Book.

Class	1	Bulls with 6 teeth
»	2	» » 4 »
»	3	» » 2 »
»	4	Bull calves
»	5	Cows with 6 teeth
»	6	» » 4 »
»	7	» » 2 »
»	8	Heifer calves.

B) Cattle for breeding purposes, bred in the open.
Entered or not in the U. H. B.

Class	1	Bulls with 6 teeth
»	2	» » 4 »
»	3	» « 2 »
»	4	Cows with 4 »

C) I. Stall-bred breeding sheep entered in U. Flock Book.

Class	1	Rams of various ages
»	2	
»	3	
»	4	Ewes of various ages
»	5	

II. Not entered in U. F. B.

Class	1	Rams of various ages
»	2	
»	3	Ewes of various ages
»	4	

D) Milking Breeds.

Class	1	Bulls, pure-bred, entered or not in the U. H. B.
»	2	Cows, pure-bred » » » » » »
»	3	Cows with calves of any breed.

E) Fattened steers bred in the open in groups of three head of the same age and breed and belonging to the same owner.

Besides the above there are classes for farm buildings, stables, agricultural machinery and implements, industries connected with live stock, and for horses.

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

888 TALANOFF, V. **Relation between Rainfall and the Maize Crop in Russia.** (Savisimosti Uroxaiev Kukurusi ot Kolicestva Osadkov). — *Juxno Russkaia Selskokhosiaistvennaia Gazeta* (Agricultural Review of South Russia), No. 10, pp. 11-13. Kharkov, April 1912.

Russia Between the years 1908 and 1911 numerous experiments were carried-out at the Agricultural Experiment Stations of Annov, Irgen, Kamen, Mariupol and Grushevsk in the government of Yekaterinoslav, on several native and foreign varieties of maize.

Agricultural and meteorological observations on the influence of rain on the growth and yield of maize are particularly interesting as, dealing with numerous varieties of maize which go through their various phases of vegetation in different periods, it is possible, besides determining the " critical period ", to select that variety which is most suited to local climatic conditions.

STATION	Year	Rainfall (in mm.)			Yield of Grain (in lbs. per acre).			
		June	July	May, June, July, August	Sterling	Grushevsk (native)	Brown-county	Cinquantino
Annov	1908	35.6	93.4	—	2235	—	—	1650
	1909	114.6	38.8	171.7	1548	1637	1529	830
	1910	40.1	83.5	197.5	2896	2124	2341	1624
	1911	80.0	108.7	369.4	2558	2152	1705	1692
Irghen	1908	55.2	86.7	183.1	—	—	—	1271
	1909	72.3	17.9	108.8	2652	2273	2138	1055
	1910	55.8	102.3	209.3	2909	2043	2354	1367
	1911	80.7	43.1	192.3	2639	2633	2354	1786
Kamen	1908	55.9	82.4	222.8	2111	—	—	1163
	1909	33.2	27.3	88.8	744	906	947	663
	1910	51.8	59.4	180.8	2273	1854	1854	1569
	1911	66.5	48.0	134.2	1150	1177	1014	947
Mariupol	1908	146.0	77.6	—	—	—	—	—
	1909	45.1	39.0	99.3	1204	1231	1231	744
	1910	40.2	31.8	151.3	2724	1851	—	—
	1911	51.9	36.0	143.6	1664	1529	1461	974
Grushevsk	1908	73.0	25.8	155.5	2720	—	—	—
	1909	28.8	15.0	57.7	514	595	988	947
	1910	53.6	14.9	125.2	2314	1826	2100	1543
	1911	24.6	41.9	174.1	1650	1394	1501	1028

The table gives:

1. The total amount of rainfall in millimetres in the months of May, June, July and August.
2. The quantity of rainfall of June and that of July.
3. The yield of maize in lbs. per acre (dry weight of grain).

From the above data the relation between rainfall, especially that of June and July, and the crops is clearly seen.

The differences in the yield between the early and the late varieties are evident, in all the plots, during the wet years.

The Sterling variety (late) thrives better in Annov and Irgen where the rain is usually more abundant, and gives slightly inferior yields at Mariupol and at Grushevsk.

The varieties most adapted to all four experiment fields appear to be Sterling (which produces at Annov and Irgen 406 lb. per acre more than the local type); Early White Horse-tooth, Minnesota No. 161 and Minnesota No. 13. In the driest district of Kamen, Sterling, Horse-tooth and Minnesota No. 161, while being still very satisfactory for yield, do not exceed the native varieties so much as in the preceeding case, namely 81 lb. as against 406 lb. Lastly at the Grushevsk station, where the average rainfall is lowest, Sterling loses its leading position which is taken up by Browncounty followed by Minnesota No. 13 and Gordosti Sievera (Pride of the North). Sterling exceeds the local varieties by 202.5 lb. per acre, and Browncounty by 297 lb. per acre.

From the above the following general conclusions may be drawn:

1. In years with abundant rainfall during the months which are the most important for the development of maize (June and July), the best results are obtained with Sterling and Horse-tooth, rather late varieties.
2. But when in June and July the rains are not abundant the moisture begins to be insufficient for these two varieties on account of their greater development, the middling early varieties, native Grushevsk and Minnesota No. 13, are to be preferred.
3. In dry years the small amount of moisture allows only the earliest varieties to yield a crop. Among these the best are Browncounty, Minnesota No. 13 and Bessarabskaia.

889

HÉJÁS, ENDRE. **The Average Annual Distribution of the Rainfall in Hungary according to the Observations made from 1901 to 1910.** (A csapadék évi átlagos eloszlása Magyaroszágon az 1901-töl 1910-ig terjedö 10 év megfigyelései alapján). — *Vizügyi Közlemények*, II Year, II Part. Budapest, March-April 1912.

Hungary

After giving a historical account of pluviometric maps in Hungary, the writer (one of the Staff of the Royal Hungarian Meteorological Institute) deals with the distribution of the rainfall in that country.

From 1870 to 1880, rain-gauges flush with the ground were used ; they were 0.1 sq. m. (155 sq. in.) in size with rather shallow reservoirs from which the wind easily removed newly-fallen snow. For this reason, the former snow measurements were not exact. From 1895, the Meteorological Institute provided its new stations with much deeper rain-gauges, and from 1900, each station receives two rain-gauges made on the Hellmann system. These stand 1 metre (3 ft. 3 in.) above the ground, hold the rain in closed receptacles, and can store up 200 mm. (7.8 in.) of water. Further, the wind cannot carry away the snow, especially as the vessels are placed in sheltered spots.

In Hungary, as elsewhere, the rainfall is the most variable meteorological factor over small areas. Neighbouring localities can present great differences in this respect.

On the other hand, the rainfall increases with the altitude (more relative altitude than absolute) and also depends much upon the form and position of the mountains.

The great Hungarian plain which is about 100 m. (330 ft.) above the sea receives 500 to 600 mm. (20 to 24 in.) of rainfall annually ; the same amount falls also in the basin of Transylvania, though in places it is more than 300 m. (975 ft.) above sea-level. The plateau of Szepes, which is characteristic of the meteorological conditions obtaining in the country, receives on a large part of its surface 605 mm. (23.8 in.) of rain annually. In some parts, however, it is over 700 m. (2300 ft.) in altitude. It is true that these areas are protected towards the west by mountains.

The second important factor is distance from the sea. Hungary is nearest to the Adriatic, but the Mediterranean has more influence upon it, and especially the Atlantic, which sends to the country, as to all Central Europe, the greater part of its rain borne on the west winds. In Hungary, most of the summer rainfall (60 %) is due to storms (so called heat-storms). This is a great boon to the large plain especially.

The country, further, belongs to that zone of the globe which, after the tropics, has the most abundant rains. The rain of this zone is due largely to atmospheric depressions. According to de Bebber the extensive plain of Hungary is one of these " zugstrasse " (Vb) where the depressions pass in a SW-NE direction. This circumstance has, however, been much less observable during the ten years in question, than when de Bebber wrote. Hann in his " Lehrbuch " (p. 357) attributes an exaggerated importance to this fact when he gives as an example the great Hungarian plain, which "in spite of its continental situation, and its almost complete girdle of mountains, has an average rainfall exceeding that of Moravia and Bohemia, although both these countries are much nearer the Atlantic Ocean. But it lies on a course which is often taken by atmospheric depressions in Hungary, on their way from the Mediterranean and the Adriatic to Poland ".

The writer is of opinion that the favourable condition of the Hungarian plain is due to the summer storms, which take their rise in local depressions.

According to present data, it is only in the Oszus mts., NNW. of Fátra, that the average annual rainfall is higher, reaching 1200 mm. (47 in.). Róna deals exhaustively with the question of winds giving rise to rain.

M. Héjás has made a chart of the rainfall in Hungary from observations made from 1901-1910 in 1 100 rainfall stations.

The data which are given are sufficiently homogeneous, and allow of the curves of rainfall distribution being traced more exactly than hitherto. Where the data were not exact, the direction of mountains is followed and denoted by dotted lines. The rainfall of the great plain is indicated in the same manner, to show its driest portion which has an annual average of 550 mm. (21.6 in.). The lines are drawn, as is customary, at every 100 mm. (3.9 in.), and not only below 1000 mm., but also above it.

On the map, the line of 600 mm. (23.6 in.) rainfall encloses nearly all the great plain of Hungary. This amounts to nearly one third of the country. Within the 600 mm. line there is another dotted line (of 550 mm. = 21.6 in.), enclosing nearly the same area. Further, a third line of 500 mm. (19.7 in.) along the course of the Tisza shows the driest portion of Hungary. This scarcity of rain being noted by 10 stations and this area being found exactly in the centre of that circumscribed by the 600 mm. line of M. Anderkó, its reality seems beyond any doubt. On the other hand, it is certain that the period 1901-1910 was drier than the normal average, and that data based on more numerous observations would change these figures in the future, thus confirming Róna's observation, according to which the average annual rainfall is not below 500 mm. (19.6 in.). Parallel to the 600 mm. (23.6 in.) line runs that of 700 mm. (27.5 in.) which includes the greater part of the country.

The mountainous district on the sea-coast has the heaviest rainfall, with 4139 mm. (162.9 in.) in 1902, which makes it one of the wettest districts of Europe. The mountainous districts of the N. E. Carpathians and part of the East come next, with a rainfall of 1500 mm. (5.9 inches). The mountainous district of N. N. W. Hungary comes third; here, owing to the varying directions of the mountains, the conditions are very variable, and the rainfall has been estimated as exceeding 1200 mm. (47.2 inches).

EREDIA, F. **Climatology of Tripoli and Benghazi.** (Climatologia di Tripoli e Bengasi). Ministero degli Affari Esteri. Direzione centrale degli Affari Coloniali. — *Monografie e Rapporti Coloniali,* No. 4, pp. 1-79. Roma, 1912. **890**

A complete study on the climatic conditions of Tripoli and Cyrenaica.

Tripoli Cyrenaica

The conclusions are rendered more instructive and interesting by the corresponding data for some cities of Southern Italy and of Sicily.

MEAN TEMPERATURES.

	January	February	March	April	May	June	July	August	September	October	November	December	Whole Year
	C.	C.	C.	C.	C.	C.	C.	C.	C.	C.	C.	C.	C.
Foggia . . .	6.3	7.6	10.0	13.7	18.0	22.6	26.1	25.7	23.0	17.0	11.3	7.7	15.8
Lecce. . . .	8.7	9.4	11.2	14.3	18.1	22.5	25.3	25.1	22.4	18.3	13.4	10.2	16.6
Palermo . .	10.3	11.0	12.6	14.9	18.1	21.7	24.6	24.9	22.9	19.5	15.1	11.9	17.3
Catania. . .	10.5	10.0	11.8	14.3	17.9	22.3	25.6	25.7	23.2	19.0	14.3	11.0	17.0
Syracuse . .	10.7	11.0	12.5	14.6	18.0	22.3	25.5	25.9	23.5	19.7	15.3	12.2	17.6
Tripoli . . .	12.0	13.1	15.3	18.0	20.4	23.5	25.7	26.4	25.5	23.2	18.6	14.1	19.7
Benghazi . .	13.2	14.4	16.17	19.1	22.1	23.9	25.6	26.2	25.6	23.7	18.9	15.3	20.3

The average temperatures of June, July and August at Tripoli and Benghazi do not differ much from the temperatures observed at the same time in the other above mentioned cities, whilst the temperatures of the remaining months, to a greater extent at Benghazi than at Tripoli, differ more sensibly, attaining higher figures in the spring and autumn months. The averages of January, February and December for Tripoli are near those of Syracuse and Catania. The annual variations in temperature are the same for all the cities, as they rise and fall together.

There is at Tripoli and Benghazi a smaller difference in the temperature in passing from one month to another. Uniting under the denomination of cold half year all the months having a temperature below the yearly mean the following figures are obtained:

	Foggia C.	Lecce C.	Palermo C.	Catania C.	Syracuse C.	Tripoli C.	Benghazi C.
Cold half year . . .	9.5	11.2	12.6	12.0	12.7	15.2	16.3
Warm half year . .	22.1	22.0	22.0	22.3	22.7	24.1	24.5
Difference	12.6	10.8	9.4	10.3	10.0	8.9	8.2

Considering seasonal groups the following figures are obtained:

	Foggia C.	Lecce C.	Palermo C.	Catania C.	Syracuse C.	Tripoli C.	Benghazi C.
Winter	7.2	9.4	11.1	10.2	11.3	13.1	14.3
Spring	13.9	14.5	15.2	14.7	15.0	17.9	19.8
Summer . . .	24.8	24.3	23.7	24.5	24.6	25.2	25.2
Autumn . . .	17.1	18.0	19.2	18.8	19.5	22.4	22.7

The spring and autumn temperatures of Tripoli and Benghazi are thus higher by about four degrees than those of Sicily, while the summer temperatures are very little higher.

The intermediate seasons follow each other almost imperceptibly, and that progressive variation of temperature which in higher latitudes marks the passage from one season to another is not manifest.

The *average rainfall* that is observed in the southern Italian cities, with the exception of Foggia, is almost double that of Tripoli. The monthly readings for January, December and February do not differ much, but in the rest of the year the rain all measurements at Tripoli and especially at Benghazi are inferior to those in the southern Italian cities. It is in spring and in autumn that the rains are scarce at Tripoli and Benghazi, whilst they fall in fair quantity in Sicily and Apulia.

RAINFALL.

	January	February	March	April	May	June	July	August	September	October	November	December	Whole Year
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Foggia . . .	54.0	29.8	35.0	41.7	44.8	30.5	14.7	31.0	35.4	56.0	56.9	43.1	473.9
Lecce . . .	68.7	56.9	54.3	57.7	42.3	27.7	10.8	17.3	50.1	83.8	78.8	85.3	633.7
Palermo . .	102.2	78.8	71.9	66.3	35.1	16.1	7.8	14.3	37.4	101.0	99.1	119.1	749.1
Catania . .	86.6	57.1	51.1	38.0	22.7	5.8	3.7	10.3	50.9	90.3	109.7	105.2	631.4
Syracuse . .	94.9	66.7	41.	39.0	20.6	5.2	7.5	7.1	48.5	92.9	108.8	104.5	636.9
Tripoli . . .	93.6	52.9	24.9	14.6	7.1	1.4	0.5	1.7	12.0	39.1	59.2	113.7	420.4
Benghazi . .	77.4	37.3	18.6	3.6	2.6	0.5	0.2	0.0	3.1	12.9	53.7	66.4	276.3

Thus at Tripoli and at Benghazi the rainy period is shorter.

The rainfall given in the above table is not to be considered as extending over the whole fertile region around the maritime cities of Italian Lybia; on the contrary there is reason to believe that in other localities the rainfall is greater. Judging from the numerous remains of irrigation works those regions must have had a great agricultural development which could only exist with abundant rainfall.

The scarce rainfall which appears from the present series of observations might be attributed, according to some meteorologists, to a change in the climate, which has taken place more intensely at Benghazi, due to the almost complete deforestation that has diminished the condensation of vapours on the uplands.

CLINE, J. M. **Freezes of November 13 and 29-30, 1911 in the Sugar, Orange and Trucking Region.** — *U. S. Dept. of Agriculture. Weather Bureau. Monthly Weather Review*, Vol. 39, No. 11, pp. 1714-1716. Washington 1912. **891**

United States

It is not easy to determine definitely and accurately the damage and loss to the Louisiana sugar-cane crop caused by the two frosts of last November. It is unquestionably heavy. The prospects of the sugar crop were excellent. The acreage was larger than usual, the cane was in good condition, and sugar was commanding a better price than for some time past. A profit on the crop of between $ 7 000 000 and $ 10 000 000 over last year was looked for.

Suddenly and unexpectedly there descended on the sugar belt the frost of November 13. Fortunately it continued only a few hours so that the loss was not as heavy as it would otherwise have been. Two weeks afterwards, on November 27, came another freeze more far-reaching, more severe, and far more damaging.

The loss however is not likely to be above 15 %, thanks to the weather forecast service, which was able to warn the sugar planters in time of the approach of the cold wave thus allowing measures to be taken to protect to a great extent the plantations from injury. Among cultivated plants the sugar-cane is one of the most sensitive to sudden falls in temperature.

Though both of the November freezes were sudden, the first was predicted 40 hours in advance, and the second two days before its arrival, and this saved Louisiana from millions of dollars of loss, considering both the crop and the seed cane.

The correspondents of the " Louisiana Planter " furnish some valuable information on this point. Thus from Lafayette the correspondent remarks:

« Fortunately the United States Weather Bureau gave timely warning of the coming freeze, and those planters who had standing cane were able to put it in windrows before the cold blast struck ». Those who did not take the necessary measures suffered heavy losses.

The great utility of the Weather Forecasts Service in the regions in which sugar, oranges and other crops sensitive to sudden falls in temperature are grown, is thus clearly demonstrated. The Weather Bureau in its predictions especially as regards frosts, has made great progress in the last few years, and still further improvement may be anticipated as the science of meteorology progresses.

AGRICULTURAL GEOLOGY.

892 The Soils of Tripoli.

1. VINASSA DE REGNY, P. Terreni e culture della nuova terra italiana. — *Il Coltivatore*, Anno 58, No. 1. pp. 4-8; No. 2, pp. 38-42; No. 3, pp. 70-73. Casale Monferrato, Gennaio-Febbraio 1912.
2. VINASSA DE REGNY, P. Osservazioni e notizie sui terreni della nuova terra italiana. — *Il Coltivatore*, Anno 58, No. 4, pp. 101-105; No. 5, pp. 135-138; No. 6, pp. 166-172; No. 7, pp. 197-201; No. 8, pp. 231-236. Casale Monferrato, Febbraio-Aprile 1912.

3. **Menozzi, A.** Sulla composizione di terre sabbiose della Tripolitania. — *L'Agricoltura Moderna*, Anno XVIII, No. 6, pp. 81-83. Milano, 31 Marzo 1912.

1. The author studies the various types of soil of Tripoli and of Cyrenaica, beginning with the oasis of Tripoli proper, so well known for its fertility and its wealth of subtropical crops: date palms, citrus fruit, olives, cereals, etc. The soil is decidedly sandy: the physical constitution of this sand is varied; particles of more than 1 mm. in diameter (" gravel ") form about 12 % of the whole, and particles between ½ and ¼ mm. (part of " coarse sand " fraction) about 15 %; of the remainer about 90 % is of the colloidal type. There is thus a fair quantity of relatively coarse particles mixed with sufficient clayey material. Of this soil the portion soluble in hydrochloric acid attains the high figure of 46 % and includes calcium, iron, aluminium, magnesium, and potassium, as sulphates, phosphates and carbonates. The carbonates form no less than 43 % of the soil.

Between the oasis of the coast and the Jebel there is a broad belt of " sand " desert, almost completely bare of vegetation. In the sands of Wady Ramel analysed by the author, it may be said that coarse particles are almost completely absent; only exceptionally are granules of ¼ mm. found. In these sands, it is to be noted that the sandy particles easily separable by levigation by water exceed 71 %, while the quantity of colloids does not attain 29 %. This points to mechanical alterations, that is simple disintegration, and very little chemical changes. In fact, there is hardly any vegetation and the rainfall is too scarce to produce chemical decompositions. For this soil the hydrochloric solution yields scarcely 6.5 % of soluble materials; the substances dissolved do not differ, except in quantity, from those previously mentioned; the carbonates are reduced to a minimum, barely reaching 1 %.

The difference in composition of the oasis sand and of the desert sand consists in a lesser percentage of coarse constituents and of limestone in the latter.

The proportion of coarse particles and of limestone increases gradually in proportion to the length of time that the soil has been under cultivation, and this quite independently of the sands being nearer or further from the sea. Thus the percentage of limestone varies from 44 % in the beautiful ancient gardens of Sukra to 8.66 % in the more recent gardens of Miska, and to 2.5 % in the less intensively cultivated gardens of Nagim.

The sands of the desert thus contain the elements of fertility, but to render them available the factor water is indispensable.

Rainfall being scarce (not above 400 mm., = 16 in., on average) and unevenly distributed, it cannot be reckoned upon. It therefore becomes necessary to examine the problem of subterranean waters, and regarding these, the author is very optimistic. From the Jebel down to the sea there extends, under the sand, an impermeable formation of clay which stores, as in a gigantic reservoir, the water which descends from the Jebel in numerous wadys and sinks into the sands before reaching the sea. Nothing else is required but to dig wells, and water will be found in abundance. Recent explorations seem to confirm this opinion.

2. CYRENAICA. — This region is so different from Tripoli that it would be courting disaster to apply to it the same principles and methods of farming as are applicable to Tripoli.

The mountains of Cyrenaica have but a slight resemblance to some of the Jebel behind Tripoli. But whilst the latter occupies only a small part of the easily cultivable soils of Tripoli, in Cyrenaica there is a very fertile plateau, three times the extent of the whole of Sicily, which might be cultivated at once. There are great extents of *red soils*, which are excellent everywhere, but especially so there, because being clayey they store water in their depths without allowing it to evaporate, which is an inestimable benefit in countries where the rainfall is scanty and limited to a short period of the year.

As for the composition of these soils these are no other analyses than those supplied by an English Commission sent to Cyrenaica in order to investigate the region in view of a Jewish colonisation scheme. Without repeating the complete analysis it will be sufficient to say that the organic substances in the soil vary from 3.90 % at Benghazi to 8.30 % at Mergi; that all the soils contain more or less lime; that potash ranges from a minimum of 0.14 % at Mergi to a maximum of 0.83 % at Silene; and that phosphorus pentoxide varies from 0.11 % at Benghazi to 0.79 % at Derna. All the soils yielded from 1 to 1.50 % of nitrogen.

Near the coast, there is, besides the red soil, one containing sand, marl, clay and lime, that in some places is extraordinarily deep and fertile and gives some of the valleys as, for instance, the beautiful valley of Defna to the south of Tobruk, the appearance of gardens. The valley of Defna is indeed considered to contain the richest and most fertile soil of Cyrenaica.

3. As a complement to the above the following table is given. It contains the results of analyses and investigations made by Prof. Menozzi at the Milan experiment station and chemical laboratory.

	Sandy Soils of Tripoli							
	Soil from the oasis near Tripoli	Soil from the desert beyond the oasis of Tripoli	Soil from Ain-Zara	Soil from Gargaresch (undulating ground under barley)	Soil from trenches on border of oasis near cavalry barracks	Soil from Gargaresch beyond the outposts towards Zanzur	Soil from palm groves to the west of Tripoli near aviators' camp	Soil from Sfax (Tunisi)
	%	%	%	%	%	%	%	%
Mechanical analysis.								
Particles of > 1 mm. diam. . . .	0.59	1.34	0.25	1.07	0.45	0.04	2.05	3.66
» » < 1 mm. diam. . . .	99.41	98.66	99.75	98.93	99.55	99.96	97.95	96.34
» » < $^1/_2$ mm. diam. . .	98.61	86.81	99.13	97.09	92.65	99,64	91.31	89.43
Portion that can be removed by a velocity of 0.2 mm. per second (crude clay)	5.07	3.50	1.60	2.64	1.88	0.80	1.28	2.36
Portion that cannot be removed by a velocity of 0.2 mm. per second (crude sand)	92.93	96.50	98.40	97.36	98.12	99.20	98.72	97.64
Chemical analysis.								
Moisture (loss at 105° C.) . . .	0.91	0.63	0.41	0.80	0.62	0.37	0.43	0.28
Carbon dioxide.	2.26	21.91	0.98	4.97	13.91	3.50	31.06	0.99
Equivalent to carbonate of lime	5.14 ‰	49.86 ‰	2.23 ‰	11.29 ‰	31.61 ‰	7.95 ‰	70.59 ‰	2.25 ‰
Sulphuric anhydride	0.52	1.62	0.25	0.96	1.17	0.82	2.88	0.36
Phosphorus pentoxide (total) .	0.87	0,52	0.42	0.32	0.50	0.32	0.41	0.18
Total nitrogen	0.30	0.30	0.53	0.13	0.24	—	0.30	0.20
Potash soluble in boiling 25 % HCl.	2.03	2.08	2.08	2.76	2.58	2.33	1.60	1.92
Magneseum oxide (sol. as above)	—	—	0.09	0.30	0.36	0.29	0.44	0.08
Iron oxide (sol. as above) . .	10.76	8.68	8.50	7.50	6.10	5.60	3.20	5,90
Organic carbon	—	—	0.61	1.22	1.56	—	—	—
Equivalent to humus	—	—	1.06	2.12	2.69	—	—	—
Chlorides, nitrates, ammoniacal salts.	Minute quantities							

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

898 Drainage of Wet Lands in the United States.

EASON, F. G. Drainage of the Wet Lands of Effingham County, Ga. — *U. S. Department of Agriculture, Office of Exper. Stations, Circular* 113, pp. 1-24. Washington, 1912.

KIPP, H. A. Report on the Belzoni Drainage District in Washington County, Mississippi. — *U. S. Department of Agriculture, Office of Exper. Stations, Bull.* 244, pp. 1-55. Washington, 1912.

Mc. CRORY, S. H. A Report upon the Back Swamp and Jacob Swamp Drainage District, Robeson County, North Carolina. — *U. S. Department of Agriculture, Office of Exper. Stations, Bull.* 246, pp. 1-47. Washington, 1912.

United States

Important drainage investigations have recently been carried out in the United States, in Effingham County, Georgia, in Robeson County, N. Carolina and in Washington County, Mississippi. The measures proposed consist in the improvement of the existing water courses and in the excavation of open canals for the drainage of surface and underground waters. These great general works which will shortly be carried out will be followed by a secondary system of drainage works which, according to the particular cases, will be open ditches, covered ditches or drains proper.

1. *Drainage in Effingham County.*

The area of this county is about 375 square miles, of which only 5 to 8 per cent are under cultivation. Good crops are made, the chief being cotton and maize, although oats, sugar cane, melons and market garden produce are raised. The excessive moisture of the land is not so much due to the want of natural watercourses as to their insufficient depth, to their being usually choked up by logs, trees and shrubs and to the presence of ridges which cut off the drainage of the flat lands from the rivers.

The best method of drainage to be followed is to clear the streams of trees and brush, and to excavate canals in the main branches from which laterals could be run as often as necessary.

In order to arrive at a fair estimate of the cost of improving the drainage conditions of Effingham County a preliminary plan of drainage was made for the watershed of Mill Creek (containing 12 200 acres), a fair representative of most of the creeks of the county. It is proposed to construct a canal through the entire length of Mill Creek, and to construct about 12 milies of laterals in its small branches. A portion of the work can be accomplished by floating dredges, the rest by hand.

The following is the estimate of cost:

Mill Creek Ditch.		
109 000 cubic yards dredge excavation at 12 cents per yard	$	13 080
13 000 cubic yards hand excavation at 20 cents per yard	»	2 600
Laterals.		
64 700 cubic yards hand excavation at 20 cents per yard.	$	12 940
Contingent expenses at 10 %	»	2 862
Total . . .	$	31 482

Number of acres benefited 12 220.

Average cost per acre $ 2.58.

2. *Dranage of the Belzoni District.*

The area of this district is approximately 103 000 acres. Most of the area is very flat and approximately 74 % is covered with timber and underbrush; about 21 % is under cultivation, 2 % is deadened timber land and the remaining 3 % is occupied by deep sloughs, bayous and lakes. Land under cultivation is valued at $ 20 to $ 50 per acre and timbered land at $ 10 to $ 20 per acre. The natural drainage of the entire Belzoni district is very poor, and it is proposed to divide the drainage district into eight different units, each consisting of a system of open ditches flowing into a main canal. In designing the system, the two following formulae were used in calculating the dimensions of the channels:

$$V = c\sqrt{rs} \text{ and } Q = AV,$$

in which: V = velocity of flow in feet per second.

c = coefficient of flow depending upon the nature of the banks of the channel.

$r = \frac{A}{p}$

A = area of cross section of channel.

p = wetted perimeter.

s = slope, or fall of water per unit of length.

Q = discharge of ditch in cubic feet per second.

The excavation of the ditches will be carried out by means of floating dipper dredges, by hand labour, and by dynamite blasting. The minimum size of the dredge ditches has been fixed at 14-foot bottom, 20-foot top and 6 feet depth. This will permit the operation of hull boats for the carriage of the plant required. Dynamite blasting allows of the ditches being made at a low cost, but it is not certain that successful blasting can be done in close alluvial soil.

The total cost of the survey, including field work (plans and levels) and office work (report, plans, sections, estimates) amounted to $ 5700. The total estimated cost of the necessary construction work is $ 241 053, which for 90 158 acres actually benefited gives an average cost per acre of $ 2.67. As for the division of expenses, a distinction must be made between the medium wet lands and the very wet ones; the former will bear 33 % and the latter 67 %. And if a part of the expense be charged to the roads and railways which will be benefited by the drainage the cost of improving the cultivated areas will diminish by about 5 %.

3. *Drainage of Robeson County.*

The total area to be drained is 32 850 acres. Back Swamp, situated on the south side of the Lumber River, contains 21 550 acres, about one-third of which is under cultivation; near it is Jacob Swamp, 9980 acres in extent, about one fourth of which is cultivated. The remaining 1320 acres, about 10 % of which is under cultivation, are on the gum and cotton mill branches. The principal crop in the district is cotton, but maize, wheat, tobacco and potatoes, and apple, peach, pear and fig trees are grown also. The value of the unimproved lands ranges from $ 10 to $ 35 per acre, and that of the improved portions from $ 25 to $ 100. As in the preceding case the present drainage channels are inadequate, and the drainage will consist in the excavation of open canals of which the largest can be economically made by floating dredgers. The total estimated cost is as follows:

Back Swamp	$	92 488
Jacob Swamp.	»	40 288
Cotton Mill Branch	»	3 190
Gum Branch	»	6 655
Total . . .	$	142 621

or average cost per acre $ 4.34.

Mc Intosh, S. **Irrigation and Reclamation in South Australia.** — *The Journal of the Department of Agriculture of S. Australia,* Vol. XV, No. 8, pp. 806-813. Adelaide, March 1912. **894**

South Australia

Irrigation has chiefly developed in the Renmark district along the Murray Valley.

The various irrigation works are administered by the Renmark Irrigation Trust No. 1., a body elected periodically from among themselves by the ratepayers of the settlement. The area irrigated has increased from 2700 acres in 1896 to 5157 in 1911. Most of the irrigation is carried out with water pumped from the river at a cost of 1*d* per 19 000 gals., and is delivered on the irrigation level through a second pump at a cost not exceeding 1*d* for 9000 gals. The annual average irrigation requirement along the river settlements is from 20 to 30 inches. The cost of pumping on the majority of the higher irrigation lands averages from 30*s* to 40*s* per acre per annum.

At Berri, near Renmark, 780 acres of irrigable land have been allotted. An area of 79 ½ acres has been set apart for irrigation experimental work. The site includes all classes of soil common to the Murray Valley. It is intended to carry on fairly extensive trials with fruit trees and vines of marketable varieties, fodders and other economic plants.

The Pyap Proprietary Company is already irrigating a considerable acreage of orchard and vineyard and land for fodders. The highest level irrigated is 120ft. and the capacity of the plant 175 000 gals per hour.

Pumping plants are becoming always more numerous. Near Ramco, on a 2000 acre property there are 65 acres orchard and 100 acres lucerne under water command, with a supply of 360000 gals per hour. The North-West Bend Estate contains 400 acres under water command; a further 500 acres could be irrigated with profit. Pumping plants with a capacity of 407 500 gals. have been erected. At Brenda Park 1000 acres are watered. The full pumping plant has a capacity of 520 000 gals. per hour.

With judicious cultivation and irrigation, crops of 2 tons of currants and raisins per acre are no exception. Lucerne yields up to 36 tons of green fodder per acre.

In the North, at Pekina, 429 acres are watered, divided into 45 blocks. The water is supplied through a main from the head works or reservoir. Each block is furnished with a meter and at present a number of settlers are attempting the sprinkler system of irrigation, the practical result of which is, however, doubtful on areas of over an acre in extent.

An experimental block of 49 ½ acres has been established, on which the various methods of irrigation are being experimented with.

Thirty-six samples of lucerne seed are being tested. A number of grass experiments are also being conducted, in addition to manure and cultivation tests, besides those to ascertain the optimum quantities of water necessary to secure maximum yields of produce per acre.

TILLAGE AND METHODS OF CULTIVATION.

895 KREBS, K. A **Method of Retaining Water in the Soil.** (Ein Beitrag zur Wasseranreicherung im Boden). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, No. 32, p. 307. Berlin, 20. April 1912.

Russia

In regions of scanty rainfall the water derived from melting snow can be retained in the soil by preventing the dispersal of the snow by wind. This can be done in three ways:

1) *American Fallow.* — Maize is sown on the fallow land in rows 3 to 5 ft. apart; in the autumn, winter cereals are sown between the rows. After these are sown, the maize cobs are cut and the stalks left; these act as obstacles which prevent the removal of the snow.

2) *Kherson Method.* — This is similar to the preceding, but the rows are 6 to 12 ft. apart; this impovrishes the soil less and facilitates the working of the soil in summer.

3) *Method employed by the Besentschuk Experimental Station.* — In spring, sunflowers and maize are sown, on fallow land, in series of three rows, the maize being in the centre. The space between the series is 65 ft., and that between the rows of the same series is 2 ft. 6 in.

The direction of the rows is at right angles to that of the prevailing winter winds. After the harvest, the stalks of the sunflowers and of the maize are left and the spaces between are sown to winter cereals. To avoid loss of space, in the spring the stalks of sunflowers and maize are removed and the soil is worked and then planted with spring cereals.

This method is followed in districts near the Volga and gives excellent results.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

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BLANCK, E. **The Cementing Substance of Sandstones as Nutritive Medium of Plants.** (Gestein und Boden in ihrer Beziehung zur Pflanzenernährung, insbesondere die ernährungsphysiologische Bedeutung der Sandstein-Bindemittel-Substanz. — *Mitteilung des agric.-chem. Institutes der Universität Breslau*). *Die landwirtschaftlichen Versuchs-Stationen*, Bd. LXXVII, H. III und IV, pp. 129-216 + taf. 1. Berlin, 22. April 1912.

While unweathered rocks are, as a rule, unadapted for sustaining plant life, clastic sandstones when they are merely broken into fragments form an exception.

The cement which binds the rock particles together is a product of geological disintegration which contains plant food in a much more soluble state than is met with in the siliceous magma of crystalline rocks.

Germany

The author has conducted two series of experiments of pot-cultures, growing oats and peas for two consecutive years in freshly broken fragments of four sandstones in comparison with river sand. The results of analyses show that with one exception the sandstones were much poorer in nutritive substances than the river sand.

The author in the first place determined, by extraction with hydrochloric acid, the chemical nature and quantity of the cementing substance. This explained the above-mentioned exception by the high content in cement of the sandstone richer in nutritive substances: it was 7.656 %, while for the other three it varied from 0.423 to 0.489 %. The chemical composition of the cement is given as follows (percentage anhydrous matter): lime, 2.45 to 33.04; magnesia, 1.23 to 14.24; phosphoric acid (as P_2O_5), 1.16 to 5.52; sulphuric acid, 0.20 to 6.21; potash, 0.27 to 1.77; soda 0.46 to 4.88. The portion of the rock soluble in carbonic acid contained 0.007 to 0.093 % of lime and 0.004 to 0.006 of potash.

The experiments of the first year gave the following results on the utilisation of nutritive substances:

	Oats		Peas	
	sandstones %	sand %	sandstones %	sand %
Lime	0.02-5	1.70	0.38-22.46	15.84
Magnesia	0.04-6	0.89	0.27-12.92	3.07
Phosphoric acid (as P_2O_5)	0.01-3.09	0.40	—	—
Sulphuric acid (as SO_3)	3.04-22.11	9.08	11.88-20.73	38.89
Potash	9.66-20.71	11.90	9.34-14.89	11.12
Soda	2.62-5.64	0.76	5.95-7.44	1.18

From special data it appears that cretaceous sandstones with less cement gave a better utilisation than a richer one containing siliceous substance in its composition.

In the second year, similar results were obtained with oats. But with peas the sandstone with siliceous material gave a greater crop, because the greater utilisation of the nutritive substances did not take place in the first year; another sandstone with a cement richer in lime also gave a heavier crop. It is worthy of remark that the peas did not utilise any phosphoric acid, not even in the second series of experiments.

Lastly the comparison with a quartz sand, very poor in nutritive substances, confirmed the advantage derived from the cement, though even in the poorest medium the plants utilised to the utmost the nutritive substances present.

In conclusion :

1. The value of the product resulting from the weathering of rocks as nutritive medium for plant growth is confirmed.

2. Among rocks, sandstones, as being directly utilisable, form an exception.

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Recent Work on Soil Microbiology.

(Figures in brackets with an asterisk refer to the bibliography at the end of the article).

France

In some interesting experiments, Müntz and Gaudechon have shown that the intensity of nitrification in the soil increases considerably in spring even at a constant temperature of 0° C. There appears to be a maximum bacterial action at the time of " reawakening " of the soil, which occurs between the 28th of March and the 25th of April in the climate of Paris; the maximum observed was 406 mg. of nitrogen nitrified in a fortnight per kg. (calculated as soil dried at 100° C.) in ordinary earth, and 1706 mg. for mould. This period of maximum nitrification corresponds to the local expressions " la terre est en travail ", " la terre est en amour ",

' la terre est amoureuse ", which are used to indicate the revival of vegetation which takes place at the end of winter (1*).

In connection with these experiments the first results of some begun in 1903 at the Utah Experiment Station may be considered; they were concerned with the fixation of nitrogen in irrigated and non irrigated land. It was found that in both cases the winter rains carried the surface nitric nitrogen to a depth of 7 to 8 ft. in the soil, where it accumulated to form " nitrate belts ". On the non-irrigated plots this nitrate belt rises gradually to the surface towards the end of July, accumulating in the top foot, whence the nitrate is taken up by the crops or carried down again by the autumn rains. On the irrigated plots the same rise to the surface takes place, but during irrigation the belt becomes indefinite. In a fallow a loss of nitric nitrogen from the surface-stratum occurs; in a semi-arid climate, that is without rain to carry the nitrates down again, it is probable that there is some bacterial transformation of nitrates into insoluble proteins. There were found to be distinct differences according to the meteorological conditions of the different seasons, as well as those due to differences of the crops (2*).

There can be no question that the working of the soil has a decided influence on bacterial activity. Some experiments on this question made by the Kansas Experiment Station have given the following preliminary results:

1. Comparatively deep ploughing (8 to 10 in.) tends to increase the number of bacteria in sandy and silty soils.

2. Deep ploughing also tends to encourage the bacterial activity resulting in increase of ammonia.

3. Deep ploughing also tends to diminish denitrification, *i. e.* reduction of nitrates with liberation of ammonia.

4. Increase of soil-temperature increases bacterial activity, while excess of moisture reduces it and diminishes the number of bacteria.

5. The maximum number of bacteria occurs at a depth of 5 to 6 inches.

6. Different kinds of bacteria predominate in the soil according to the conditions; there are also maxima and minima of bacterial activity which are to a certain extent independent of moisture and temperature, and probably depend on the presence of secondary products of this activity (3*).

The practice of soil-inoculation in the United States began as long ago as 1897. In the last few years the Department of Agriculture has distributed a great many cultures of bacteria, at the same time making careful enquiries as to the results obtained by farmers with them. A noteworthy point is the number of doubtful cases, comprising a good many cases of loss of crop from other causes, as well as soils already inoculated and trials without controls. From seven years' data it appears that 76 % of the results have been successful, and 24 % unsuccessful, excluding doubtful cases; if these are included, the succesful cases fall to 38 %. The present state of affairs in the United States may be summarized as follows: The method of inoculation by pure cultures is less certain than that by soil already inoculated; it has, however, the advantage of being cheaper, and of facility of carriage and application, and entails no possibility of introducing weeds and diseases.

In any case experiments on a larger scale are required, special attention being given to local conditions and methods of cultivation, so as to determine the limitations of pure cultures (4*).

Some experiments on the inoculation of Leguminosae carried out for ten years at the Station at Dresden under the direction of Prof. Simon are of special value. He has calculated the cost of inoculation with various materials, on the basis of 1910 prices, as follows:

Azotogen	1*s* 7*d*	per acre
Nitrobacterin	2*s* 3*d*	»
Nitragin, continental	3*s*	»
Nitragin, colonial	6*s*	»
Farmogerm	8*s* 2*d*	»
Nitroculture	16*s*	»

This shows the advantage of azotogen, a preparation of nodule-bacteria in soil made by Prof. Simon, and put on the market in 1910 (5*). With regard to nitragin, the commercial product should be distinguished from Prof. Hiltner's culture (6*).

Some other experiments tend to confirm the belief that soil bacteria have no solvent action, or only a very slight one, on phosphates; a very slight action was obtained with pure cultures of *Bacterium radicicola* and *Bacillus pyocyaneus* (7*). It has also been shown that potash, while useful to *Azotobacter*, is not indispensable for it like lime and phosphoric acid (8*).

Experiments with *Bacillus fluorescens liquefaciens*, *B. pyocyaneus*, *B. denitrificans* and *Bacterium Hartlebii* have shown that potassium, sodium, calcium and ammonium nitrates (with equal nitrogen content) are reduced at the same rate by these organisms (9*). The optimum concentration for *B. pyocyaneus* was 1 % of dextrose and 1 ½ % of nitrate; in the formation of protein 100 mg. of sugar were used per mg. of nitric nitrogen (10*). Other experiments tend to show that in the decomposition of cyanamide humic substances are of more importance than bacteria (11*).

Some methods for determining the value of soils by microbiological means have been proposed; certain properties of the soil can be determined by them more exactly than by the ordinary physico-chemical methods. Thus the available nitrogen of a soil can be determined from the relation between the amount of carbon dioxide given off on the addition of a known quantity of nitrogenous matter, and that given off without any such addition. The optimum conditions for this determination are to add ammonium sulphate and cellulose in the proportions of 0.125 and 1.25 % of the soil, as well as the other nutritive elements (12*).

PRACTICAL CONCLUSIONS.

I. The so-called reawakening of the soil at the beginning of spring coincides with a maximum of activity of nitrifying bacteria.

II. In spring a nitrate belt occurs 7 to 8 ft. down; this comes to the surface in the summer, and on non-irrigated soil is used by the crops, but irrigation has the effect of dispersing it again.

III. Ploughing to 8 to 10 inches is favorable to the activity of useful bacteria.

IV. From experiments carried out particularly in the United States, it appears that inoculation by already inoculated soil is more certain than that by pure cultures of bacteria; but the saving of expense in using pure cultures makes the subject worthy of further investigation.

V. Bacteriological methods are important for determining the value of soils, especially with regard to the reserves of nitrogen.

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Cf. also: MIGULA, System der Bakterien, 2 Bd.

LAFAR, Handbuch der Technischen Mykologie, 3 Bb. Mykologie des Bodens, des Wassers und des Düngers.

LÖHNIS, Handbuch der landwirtschaftlichen Bakteriologie.

MANURES AND MANURING.

898 The Utilisation of the Phosphates of Central Russia.

Russia

The utilisation of the rich phosphate deposits of Central Russia and of the pyrites of the Urals, is of the greatest importance for the supply of artificials for central and eastern Russia and, owing to the importance of the produce of these regions it may be said to be of interest to the agriculture and trade of the whole world.

The amount of superphospates imported into Russia in 1909 was 68 569 tons, as against 31 685 tons in the two preceding years, besides 80 688 tons of basic slag as against 56 482. Among the phosphate deposits those of Kostroma alone appear to contain no less than about 9 000 000 tons (1*) (10*) (11*) (12*).

According to the resolutions of the Ministerial Commission nominated in 1908 to study the problem of the utilisation of the above deposits some experiments on the utilisation of the Kostroma and Kasan phosphates were made in 1909 in Prof. Prianishnikoff's laboratory at the Moscow Agricultural Institute. In 1910 these experiments were repeated in practical farming and extended also to the Viatka phosphates, experiments also being made with other minerals.

In the following table the characteristic analytical data of these phosphates are given in comparison with those of Carolina to which they bear some resemblance.

	Phosphates			
	Kostroma %	Kasan %	Viatka %	Carolina %
Phosphoric acid (as P_2O_5)	27.19	26.45	26.47	27.64
Carbon dioxide	5.97	5.83	4.25	4.53
Lime	42.82	42.01	39.6	42.94
Ferric oxide and allumina	4.21	4.20	4.55	4.64
Hygroscopic water	0.57	1.66	1.89	1.15
Residue, insoluble in acids (silica)	5.75	3.87	10.99	7.79
Loss on calcination	6.89	10.9	10.77	7.70

Treated with 10 % sulphuric acid, the phosphates of Kostroma, Kasan, Viatka and Smolensk showed that the maximum of phosphoric acid corresponded to a determined quantity of the sulphuric acid used; nevertheless above a certain limit, the increase of the quantity of sulphuric acid caused a diminution in the amount of phosphoric acid extracted. The maxima of the latter were:

Phosphate	%
Kostroma	66.7
Kasan	46.95
Viatka	73.5
Smolensk	69.7

The fact is worthy of note, that the quantity of sulphuric acid used in the reaction was nearly the same in each case, varying only by 6 % for each phosphate. (5*).

After the preliminary investigations made in 1909, experiments on a large scale were carried out in 1910 at two factories.

In one of them, owing to the relative poverty of the material used, a superphosphate containing 11 % water-soluble phosphoric acid and 19 to 20 % of moisture was obtained. This contained only 1.1 to 1.6 % of insoluble phosphoric acid, thus showing the close resemblance between Kostroma phosphate, and those of the Carolina type.

In the other works in the Government of Kostroma a superphosphate was obtained containing 13.9 % of water-soluble phosphoric acid and 15.5 to 17 % water and citrate-soluble, calculated on the dry substance. This would be a fairly good product, but, to meet the eventual demand for still richer superphosphates, following upon some experiments conducted by Kochetkoff, fertiliser expert to the Russian Ministry of Agriculture, it was possible to prepare a superphosphate containing 14.5 to 15 % of water-soluble phosphoric acid and 16.8 to 17 % water and citrade soluble out of a total of 17 to 17.4 %, always referring to the dry product. The moisture content of the fresh superphosphate was 13 to 16 %. (3*) (4*.)

The laboratory experiments with Viatka phosphates have shown that good dry powdered superphosphates containing 12.5 to 13.5 % water soluble phosphoric acid and 14 to 14.5 % water and citrate soluble, out of a total of 14.5 to 15 %, can be obtained.

This points to a certain superiority of Viatka supers over similarly prepared Kostroma and Kasan supers. The cost of Viatka super may be calculated at 1.73*d* per lb. of water soluble phosphorus pentoxide and 1.51*d* per lb. of water and citrate soluble pentoxide. These data and the extent of the deposits, from 59.3° to 60.5° N. and 20.0° and 22.8° E. render the Viatka phosphates a solid basis for the superphosphate industry of the region. (2*).

Already in 1909 Kochetkoff in a long series of experiments had been successful in preparing double superphosphates by using an excess of crude mineral. Satisfactory results were also obtained by Viborgs' process, which consists in melting the mineral with sodium carbonate. Shuloff conducted cultural experiments on wheat, rye and spring oats with the various products obtained in the laboratories compared with basic slag, and found that Viborgs' superphosphate prepared from Kostroma mineral and with a smaller quantity of sodium carbonate, (¼), proved to be the best and the cheapest.

According to experiments made by Kochetkoff it appears that also Kasan Viborg super contains a fair amount of assimilable phosphoric acid, 21.57 and 19.10 % citrate soluble, according to the treatment with ½ or ¼ of sodium carbonate. The Smolensk Viborg phosphate was very efficient notwithstanding its very low citrate soluble phosphoric acid content in comparison with the other Viborg products, which proved inferior to basic slag, but the latter was equalled by the Smolensk phosphate.

From experiments made by Kalinkin it would appear that sodium bisulphate, a by-product of the manufacture of nitric acid may be advantageously used instead of sulphuric acid in the preparation of superphosphates from steamed bone flour and to some extent from natural phosphates (Kostroma) (6*).

The following were the results of some experiments made by Shuloff on the utilisation of various phosphates by means of cultures in sand:

With white mustard	Surplus of crop over control without phosph. pentoxide gr.
Senguiley phosphate	13.80 to 8.80
Borisov (*Kursk*) phosphate	10.40 to 8.93
Polivna (*Portlandian*) phosphate	9.92 to 9.71
Kineshma (*brillant*) phosphate	9.01
Crilovka phosphate	8.65
Cashpur phosphate	8.45
Polivna (*Aquillon*) phosphate	8.25
Versenik phosphate	6.78
Volsk phosphate	6.25
With lupins	
Senguiley phosphates	17.75 to 13.47
Polivna phosphates	17.10 to 13.45
Kineshma (*brillant*) phosphates	11.3
White mustard obtained without phosphorus pentoxide	0.33
Lupins obtained without phosphorus pentoxide	5.25

Of general interest are Shuloff's experiments on the influence of complementary manures:

1. Oat cultures in sand, with pyrites and ferrous and ferric sulphates together with natural phosphates (Kostroma) and monopotassic phosphate, the latter being used also for the control pot. The increase in the quantity of pyrites caused a progressive diminution of yield, while small quantities of ferric sulphate had a favourable effect. On buckwheat small doses of ferrous sulphate were favourable or had no effect, while larger doses were injurious.

2. Natural phosphates rendered soluble by the action of ammonium chloride and sulphate in pots containing sand, applying the ammonium salts alone and with sodium nitrate to barley and oats. The addition in equal parts of nitrate and ammonium chloride and of a mixture of ¼ of the latter and $^{3}/_{4}$ of the former gave very nearly the same results as normal cultures with monopotassic phosphate, whilst they were negative with natural phosphates alone or with sodium nitrate.

3. Action of calcium nitrate and ammonium sulphate in equal parts on various phosphatic substances in sand; it was decidedly

favourable on basic slag, bone meal and natural Kostroma and Ural phosphates.

4. Culture experiments of oats in sand applying peat with natural phosphates; the results were favourable to the assimilation of phosphoric acid contained in the phosphate, and besides if in sufficient quantity it appears that peat itself supplies plants with some phosphoric acid. (9*).

CONCLUSIONS.

1. In Central and Eastern Russia there are extensive phosphate deposits sufficient for the needs of that part of the country.

2. These minerals, though not rich enough to interest directly the international market, do so indirectly, because when industrially prepared they might emancipate the above regions from the importation of foreign phosphatic manures.

3. The utilisation of the above phosphates is important also from the point of view of international agricultural production, for by favouring the consumption of manures which at present is hampered by the cost of carriage, it promotes the development of agriculture in these important cereal and flax producing regions.

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VOELCKER, J. A. **Experiments with Nitrogenous Top-dressings on Wheat, 1911.** (The. Woburn Exp. Stat. of the R. Agricultural Soc. of Engl. Field Experiments 1911). — *The Journal of the Royal Agricultural Society of England*, Vol. LXXII, pp. 387-404 (396-397). London, 1911. 809

Experiments with nitrogenous top-dressings carried out in 1911 at the Woburn Experimental Station of the Royal Agricultural Society of England seem to confirm the advisability of mixing cyanamide with nitrates, especially of lime (1).

England

The land used for the purpose was in a rotation after mustard; it was drilled on October 18, 1910 with 9 pecks per acre of Square Head's Master wheat. Along with it were given 3 cwt. per acre of superphosphate and ½ cwt. per acre of sulphate of potash. The nitrogenous top dressings were applied on May 16, 1911, but the drought of the year was not favourable for their utilisation.

The results are given in the following table.

Top-dressing	Head corn: Bushels per acre	Head corn: Weight per bushel	Value of corn per quarter on basis of 35*s* 6*d*	
	—	lb	*s*	*d*
Nitrate of soda	20.4	60.8	34	6
Nitrate of lime	16.7	61.4	34	6
No top-dressing	16.2	62.6	35	0
Sulphate of ammonia	15.2	63.0	35	6
Calcium cyanamide	16.8	63.0	35	6
Nitrate of lime 1 part Cyanamide 1 part	18.6	63.0	35	0
Nitrate of lime 1 part Cyanamide 2 parts	17.2	62.5	35	0

The different top-dressing were given in such quantities as to supply as much nitrogen as that contained in 1 cwt. of sulphate of ammonia.

The highest yield, that from nitrate of soda, was only 4.2 bushels more than from the plot which received no top dressing, this plot giving also the most straw.

The mixture of nitrate of lime and cyanamide, half-and-half, gave an increase of 2.4 bushels and was the second best. The mixing of the two materials was distinctly satisfactory, as thereby some of the inconveniences attaching to the use of either of the materials separately were avoided.

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(1) Cf. *B.* March 1912, No. 491. (*Ed.*).

The quality of the corn was about average, except where nitrate of soda and nitrate of lime had been used, it being then slightly inferior.

The exceptional character of the weather prevented the top dressings from acting to their full extent, and the results, though valuable, can only be taken as comparative.

900 v. HERFF, B. (Chicago). **The Consumption of Chemical Manures in the United States of America in 1910.** (Der Verbrauch von Kunstdünger in den Vereinigten Staaten von Nordamerika im Jahre 1910). — *Die Ernährung der Pflanze,* VII. J., Nr. 8, pp. 89-92 + C. 1. Gross-Lichterfelde, 15. April 1912.

United States

The Author observes that it is difficult to determine the consumption of chemical fertilisers and its distribution in the United States. Nevertheless on the basis of existing statistics completed by a few estimates, a synthetic presentment is given of this important branch of American agriculture.

The value of the chemical manures consumed in 1910 was $114 161 000 for a quantity of 6 103 633 tons. The total value likewise includes that of farmyard manure on the basis of the data supplied by the Census Office. From the same data supplemented by those of the official control of chemical manures in the States of North and South Carolina, Alabama, Virginia, Indiana, Mississippi, Louisiana, Tennessee, Texas, California, Arkansas, Missouri and Kansas the aggregate quantity was ascertained. It must likewise be taken into account that in the States of Arizona, Idaho, Montana, Nevada, New Mexico, North Dakota, Utah and Wyoming the consumption of artificial manures is little or none, so that these States are not taken into consideration. The States consuming most manures are:

	tons
Georgia	1 134 000
South Carolina	1 048 806
North Carolina	630 095

The distribution of consumption in the four principal groups of States is as follows:

	%
Southern States	75.08
North-Eastern States	19.88
Central States	4.25
Western States	0.79

In the West only the States of California, Oregon and Washington show a fair consumption of fertilisers.

With regard to the intensity of consumption, it is greatest in the following States :

	Lbs. per acre under cultivation
South Carolina	362.86
Florida	273.66
Georgia	217.57
North Carolina	204.57

The intensity per groups of States is as follows :

	Lbs. per acre under cultivation	Lbs. per cultivable acre
Southern States	93.5	72.4
North-Eastern States	55.9	39.2
Central States	3.1	2.2
Western States	5.5	3.8

Of great practical agricultural interest is the distribution of the consumption over crops and regions:

	Cotton — Tons	Maize — Tons	Other Cereals — Tons	Tobacco — Tons	Sundry crops — Tons
Southern States	2,165,130	1,042,409	408,414	131,025	836,280
North-Eastern States	—	234,026	480,679	20,163	478,505
Central States	—	30,341	154,963	5,904	52,102
Western States	—	—	—	—	48,400

Finally, the general distribution of consumption in relation to crops is as follows :

	%	
Cotton	35.4	76.6 %
Maize	21.4	
Other cereals	17.2	
Tobacco	2.6	
Other crops	23.4	

The figures reproduced do not include the territory of the Hawaiian Islands, the consumption of which in 1910 was 66 273 tons, of which 60 273 for sugar-cane, and 6 697 for other crops (pine-apples, coffee and rice). The consumption per acre under cultivation is 649.6 lb., which means that the intensity of manuring exceeds the maximum in the United States (South Carolina).

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

901 **The Influence of the Soil Type on Plant Life.**

1. BURGESS, J. L. (The Influence of the Soil Type on the Plant Variety). — *North Carolina Department of Agriculture, Agronomy Division, Bulletin*, Vol. 33 No. 1, pp. 5-6. Raleigh, January 1912.
2. BREAZEALE, J. F. and LE CLERC, J. A. The Growth of Wheat Seedlings as affected by Acid or Alkaline Condition — *U. S. Department of Agriculture, Bureau of Chemistry, Bulletin*, No. 149, pp. 5-18. Washington, March 1912.
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United States. Holland

Burgess gives the results of numerous observations and experiments on the subject of the influence of soil types upon cultivated plants. Certain general facts of adaptation are well-known; thus that in the wheat and maize sections of the Central West, the heavy clayey loam of the Miami series is best suited to wheat and the silty loam belonging to the Marshall series to maize. Early vegetables require a light sandy soil, while the lime-loving lucerne thrives in calcareous soils. But as the varieties of wheat, oats and cultivated plants in general are very numerous, so also are soil types. The United States Bureau of soils has already described more than 400; there are, for instance, 50 types of clay soils, 40 of loams, etc. Wheat prefers clay soil, but which of the 50 types is likely to afford the best conditions of growth for any given variety?

Every plant, on being transplanted into a new environment, undergoes many variations (adaptations) which, in the end, render it adapted to the soil, but which at the same time may cause it to lose characteristics which are useful to the agriculturist: productivity, resistance to drought, etc.

Thus at the Experimental Station of Indiana, the standard varieties have maintained for 15 years their yield and quality, while most of the new varieties have, as a rule, failed to do so well as the standard varieties which have long grown there.

De Vries considers that « all trouble incident to imperfect adaptation to soil can be avoided only by the farmer selecting his own seed on his own land ».

This statement is certainly true, but any one conversant with the amount of knowledge, time and patience required in developing a good and distinct variety anywhere, will see how impossible this remedy is of general application.

But with more knowledge of the relation of the different types of soil to the different varieties of crops, it will be possible for the breeders to produce and distribute seed especially adapted to particular sections. Study of the adaptation of varieties of plants to soil types has shown that each variety has been developed in a quite distinct type of soil, and study of the later history of these varieties seems to prove that they give best results only when grown on soils similar to those on which they have been developed. Indeed, it appears highly improbable that a good and distinct variety of any of our staple crops can be developed in a field where there is a mixture of soil types. Uniformity of soil is essential to the production of a uniform variety of plant.

The Toole variety of cotton was developed on the Norfolk sand, and may be expected to give better results on this and closely allied types of soil than any other variety of cotton.

Agriculturists and planters lose every year millions of dollars because they do not know the particular variety of maize, wheat, cotton, etc., which is most suitable to their fields.

Seed Selection.

There is perhaps no more potent factor in the adaptation of varieties of plants to soil types or soil environment than that of careful selection.

In a plantation of cotton plants, for instance, there are met with in the first or second generation plants much above the average both as regards growth and productivity.

The planter observes these and saves their seed, thus selecting them for sowing the next year. By thus doing he obtains at the end of a few years numerous plants which rapidly adapt themselves to the new soil conditions. The selection of seeds thus accelerates the processes of adaptation. Toole, who created the variety of cotton plant which bears his name, selected during a certain number of years the characters of precocity and greater percentage of fibre in proportion to lint, and thus obtained early varieties and raised the percentage of lint from 38 to 44.

Thus, we see that seed selection combined with uniform soil conditions modifies the plants in the desired direction (cumulative effect).

There remains now to be considered a second and not less interesting part of the problem, the action which plants exert in their turn in modifying the composition and structure of the soil. All soil which is continuously cultivated tends to become acid. The acidity or alkalinity of the soil are not only the indices of the most appropriate crops but also of the value of the yield. It is no use trying to grow lucerne in a peat bog, or cranberries in a limestone soil. On the other hand, a soil which is naturally alkaline will, under continuous cropping with a rotation containing clover, for example, give smaller and smaller yields as the alkalinity is diminished, until it will be found impossible to grow this legume on account of the acidity of the soil. This fact has often been noticed in the limestone regions, particularly in the Shenandoah Valley of Virginia. Ground lime applied to the surface soil will often restore its original fertility.

The heavy clay soils from which bricks are made are always acid, have a high lime requirement and are usually very unproductive. The oxides of iron exist in such soils in a finely divided colloidal form brought about by an acid condition, and they are usually remedied by an application of lime.

In field culture, the residual injurious effect of an application of sulphate and chloride of potassium can be overcome by mixing the fertilizer with about twice its weight of lime. Thus the harmful effect of potassium sulphate on the plant, due to the absorption of the potassium, and liberation of sulphuric acid, can be avoided. In the experiments recorded by Breazeale and Le Clerc, it is shown that seedlings grown in culture solutions containing potassium chloride, potassium sulphate, or hydrochloric or sulphuric acid solutions (10 parts per million) exert a selective action whereby the potassium ion is absorbed by the roots, while the chloride or sulphate ion is, for the most part, left in solution. This causes the solution to become acid, which in turn acts injuriously on the root development.

The addition of lime, iron, or aluminum hydrate to culture mediums containing potassium chloride, potassium sulphate, hydrochloric acid or sulphuric acid, keeps these solutions alkaline so that they act favorably on root development. This would tend to explain why field applications of sulphate or muriate of potash in time render the soil acid, and why the continued use of Chile saltpeter produces an alkaline condition of the soil.

TULAIKOW, N. **Plants and Soil Salts.** (Rastenie i soli pocvi). — *Gji-ornal Opitnoi Agronomii,* G. XIII, K. 1., pp. 27-52 + fgs. 4. S. Peterburg, 1912. **902**

Russia

From the data supplied by himself and others the Author deduces that the soluble non-nutritious salts of the soil have a noteworthy influence on vegetation from the very first stages up to harvest.

At the time of germination the non-nutritious salts of the soil appear to exercise an essentially physical action in so far as they modify the osmotic pressure, regulating the absorption of water by the germinating seeds. The specific differences of the various salts are not very conspicuous, and isotonic solutions of different salts have an almost equal action.

The toxic effect of the different salts on the seedlings of various plants is, in the majority of cases, due essentially to plasmolysis of the cellular contents. In some cases however a chemical action appears to take place, since the tissues of the root system are destroyed or its superficial cells modified.

The growth and yield of the plants is likewise clearly influenced by the concentration of non-nutritious salts in the soil solution. Thus, the phases of development take place much more rapidly with solutions of greater concentration and osmotic pressure, while the total yield and the yield of grain are greatly diminished, but the contents of nitrogenous substances both in the total crop and still more in the grain show a considerable increase, for instance in wheat.

The effect of the increase of osmotic pressure in the soil solution, resulting in a greater nitrogenous production in the wheat grains, is particularly manifest in the period of formation and ripening of the caryopses, as appears from experiments carried out with various conditions of soil moisture and at different times of development of the plants.

908 BRIGGS, LYMAN J. & SHANTZ, L. H. **The Wilting Coefficient for Different Plants and its Indirect Determination.** — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 230, pp. 83 + fig. 9 + tab. 9. Washington, 1912.

United States

The object of this investigation was to determine the extent of the variation exhibited by different plants with respect to the minimum point to which they can reduce the moisture content of the soil before permanent wilting occurs. It has hitherto been believed that plants differ widely in this respect and that drought resistance is in part due to the additional supply of water which is available to some plants through the greater force which they exert upon the soil moisture. The results of this investigation have led the writers to conclude that the differences exhibited by plants in this respect are much less than have been supposed, and are so small as to be of little practical utility from the standpoint of drought resistance.

The wilting coefficient is defined as the moisture content of the soil (expressed as a percentage of the dry weight) at the time when the leaves of the plant growing in that soil first undergo a permanent reduction in the moisture content as a result of a deficiency in the soil-moisture supply.

In making wilting-coefficient determinations, the following precautions are deemed necessary:

1) the soil used should be as uniform as possible;

2) the soil should be brought to a uniform water content before being used;

3) all loss of water should be prevented except that due to the transpiration of the plant;

4) all sudden fluctuations in temperature should be avoided;

5) the moisture determination should be made as soon as the plant has first reached a wilted condition from which it cannot recover when placed in a damp chamber.

The method employed consists in growing the plants in a small glass pot, evaporation from the surface being prevented by means of a seal of wax which is melted and flowed over the soil surface. During growth the pots are kept immersed in a water bath to avoid condensation of the soil moisture on the pot walls. The probable error of the mean of the determinations from 12 pots is reported not exceeding 1 part in 100.

Wilting-coefficient determinations have been made in a series of 20 soils ranging from sands to clays, and a large number of crops as well as of native plants have been tested.

The results obtained show that species differ only slightly as regards the soil-moisture content at which permanent wilting first takes place. Taking 100 to represent the average wilting coefficient, the different species tested (except *Colocasia* and *Isoetes*) give an extreme range from 92 for Japan rice to 106 for a variety of corn.

The results for the chiet cultivated plants gave the following values: corn 103, wheat 99, oats 99, sorghum 98, millet 97, barley 97, rye (one variety only) 94, rice 94, grasses 97, and legumes 101.

The conclusion is thus reached that the differences exhibited by crop plants in their ability to reduce the moisture content of the soil before wilting occurs are so slight as to be without practical significance in the selection of crops for semiarid regions, and as compared with the great range in the wilting coefficient due to soil texture. Furthermore, it is believed that the slight differences which have been observed are chiefly due, not to the ability of one species to exert a greater tractive force upon the soil moisture than another, but to the varying perfection of root distribution. Drought resistance in certain plants cannot, then, be attributed to their ability to exert a greater force upon the soil moisture and so gain an additional water supply.

A series of comparisons has also been made of the relative time of wilting of different plants grown together in the same pot. In practically every case wilting occurred simultaneously.

A balancing method has been developed for determining the wilting coefficient for plants in which wilting is difficult to observe owing to structural peculiarities. It has been shown by this method that the olive and the cactus undergo a reduction in the moisture content of their aerial parts at the time other plants wilt, although no outward evidence of such loss is apparent.

That portion of soil-moisture content which is available for plant growth is represented by the difference between the actual water content and the wilting coefficient. The latter determination is consequently essential in any critical study of the relation of plant growth to soil moisture. The desirability of a rapid determination of the wilting coefficient in connection with field work led the writers to an investigation to determine whether the wilting coefficient could be computed from physical measurement of the moisture retentivity of the soil. A comparison of the wilting coefficient has been made with the moisture equivalent, hygroscopic coefficient, moisture-holding capacity, and the mechanical analyses of soils ranging from sand to clay. From this comparison a series of linear relationships has been established, as expressed in the following equations, which thus provide a means of computing the wilting coefficient when direct determinations are not feasible:

$$\text{wilting coefficient} = \frac{\text{moisture equivalent}}{1.84\ (1 \pm 0.007)}$$

$$\text{wilting coefficient} = \frac{\text{hygroscopic coefficient}}{0.68\ (1 + 0.018)}$$

$$\text{wilting coefficient} = \frac{\text{moisture-holding capacity} - 21}{2.90\ (1 \pm 0.821)}$$

$$\text{wilting coefficient} = \frac{0.01\ \text{sand} - 0.12\ \text{silt} - 0.57\ \text{clay}}{(1 \pm 0.025)}$$

The second term of the quantity within the brackets shows the probable error of the relationship in each case and constitutes a measure of the relative accuracy of the different methods.

The moisture-equivalent method, in which the measurements are made with the aid of the centrifugal machine exerting a force 1 000 times that of gravity, is the most accurate and satisfactory of the indirect methods.

904 DANIEL, LUCIEN. **Transformation of a Chrysanthemum in consequence of repeated Propagation by Slips.** (Sur la transformation d'un Chrysanthème à la suite de bouturage répété). — *Comptes Rendus de l'Académie des Sciences*, T. 154, No. 16, pp. 997-998. Paris, 15 avril 1912.

France

Some time ago the English physiologist Knight proved that fruit trees vary and at times degenerate as a result of repeated graftings; it is furthermore well known that vegetative reproduction generally is often followed by similar results (degeneration of potatoes for instance).

The Author was able to observe a new kind of variation on a variety of chrysanthemum grown for 18 years only by reproduction by means of slips.

The results of the Author's observations seem to establish:

1. That repeated reproduction by slips of the chrysanthemum in question under constant conditions and apart from ordinary climatic variations, gave rise to a new variety inferior to the original, that is, to a degenerating form in accordance with the theory of Knight.

2. That this variation was *progressive* and not *sudden*, which is another instance in favour of the existence of *slow varieties* capable of yielding many new types in agreement with the theories of Lamarck and Darwin.

SELECTION.

STEBUT, A. **Methods of Selection and Choice of Varieties in Russia.** (Osnovnie Voprosci Sortoviedienia i Sortoispitivaniia).—*Juxno-Russkaia Selskokhosiaistvennaia Gazeta* (South Russian Agricultural Review), No. 9, pp. 7-10; No. 10, pp. 7-10; No. 11, pp. 5-7. Kharkov, 15 Marta 1912. **905**

Russia

What should be the method of selection work in Russia? This question is the subject of an interesting paper read by the author at the Seed Improvement Congress in St. Petersburg, from which the following general conclusions are taken:

1. Complete systematic investigations of the whole of the various cultivated plants should form the basis for choosing the varieties and for their improvement.

2. This work should in Russia be carried out in zones.

3. In each zone the local types of cultivated plants should be systematically described for the purpose of:

a) determining which are the types most widely grown in the said zone, and what are their morphological and biological characteristics;

b) ascertaining which is the type with the highest yield;

c) determining the coefficient of variability in the zone in question, as an index of the action of natural agents on the stability of forms;

d) dividing into sub-zones.

4. In each zone the appearance of extrazonal types must be accurately recorded, with the object of determining:

a) which types of cereals are most easily and which least easily acclimatised.

b) which are and which are not capable of becoming acclimatised.

5. The study and test of the largest possible number of varieties and forms should constitute the basis for methodical work of choice of varieties.

6. Only by adopting the system of grouping is it possible to extend the research in the study of types to a very large number of typical forms.

Then in the work of selection the aim must be to divide the varieties into groups on the basis of some biotypical characters.

7. Comparative experiments as to the yield of given varieties are of the highest practical utility and produce excellent results. Programmes are drawn up and special problems are attacked, the final valuation of a variety being reached in each case independently of the original valuation.

8. The system of investigation by zones entails the necessity of simultaneously subjecting the same variety to experiment in several zones, which always occurs when a type tends to cross the zonal boundaries. In this connection it is desirable to organise collective researches at the experimental stations of the zones concerned.

9. To secure uniformity of arrangement and results among the various stations, the establishment of a body in the form of a special committee or office would be desirable, to deal with the delimitation of the zones, and the seed material. This office would also be the co-ordinating centre of the work of selection of the different districts.

10. In order to make the work of study and control of the exotic species more effective and complete, the Author advocates the idea of organising in the Ministry of Agriculture a special agency, as has already been done in the United States of America. This agency should be in a position to supply the experimental stations with systematic collections of exotic seeds and at the same time to keep itself informed of progress in selection abroad, in order to derive therefrom such precepts as might likewise be adopted with special advantage in Russia.

906 LEBEDINSKII B. **The Results of taking Histological Characters as the Basis of Cereal Selection.** (Risultati Primienieniia Anatomiceskago Prisnaka pri Selekzii Khliebnekh Slakov). — *Khosiaistvo*, VII God, No. 13, pp. 413-420; No. 14, pp. 452-457. Kiev, Apriel 1912.

The study and examination of tissues constitutes a most important element in selection, and one which served as a good basis for many interesting experiments and researches on cereals (winter and spring wheat) which have been carried out by the writer partly at the Selection Station of Ivanov.

These researches can be grouped under two heads:

1) *Researches on the quantitive variations of the tissues and their elements in a single plant*: the structure of the leaves depends, to a certain extent, on their distance from the roots. The size of the mesophyll cells, of the peristomatic cells and of those of the epidermis diminishes, while the length of the veins per surface unit increases with the distance from the roots.

Considering that small cells are characteristic of xerophytes, the tendency on the part of the higher leaves to the formation of small cells is an index of an increasing tendency to xerophytic habit in the leaves which will afterwards unfold.

2) *Researches on the quantitative variation in the tissues and their elements in distinct races of cultivated plants.*

The chief objects of these researches are:

a) To isolate separate races of cultivated plants distinguished by histological characteristics.

b) To establish the relation between transpiration energy and the anatomical coefficient.

c) The adoption of measurements as a principle in the selection and creation of varieties which are drought-resistant.

The researches and experiments carried out at the Ivanov Experiment Station were made specially on the following points:

1. To distinguish species with different anatomical coefficients, which determine a different degree of xerophily.

2. To determine the optimum degree of xerophily for special conditions of climate and soil.

As anatomical coefficient the « length of the apertures of the stomata », is taken, the value of which is only comparable when the following characters are uniform: 1) the stalk from which the leaves rise; 2) the height of the insertion of the leaves; 3) the part of the leaf blade on which the determination is made; 4) the time of the development of the leaf, *viz* when the extremity begins to turn yellow.

The length of the openings of 24 (sometimes only 12) of the stomata in the two rows on either side of the midrib was measured.

In 1909 about 1500 specimens of three varieties of spring wheat were microscopically examined: these were Arnautki, Pragskoi (from Prague) and Khludov.

In 1910, the seeds obtained from plants of different coefficients were sown in separate plots and the plants of the first generation (1910) and of the second generation (1911) were examined microscopically.

In the following table the relative data of three groups (of different degrees of xerophily) of pure isolated lines of the Khludov variety of wheat are given:

		1909	1910	1911
Degree of xerophily	Distinctive number of the pure lines	Length of anertures of stomata in μ	Medium length of apertures of stomata in μ	Medium length of apertures of stomata in μ
I	5 800	54.0	57.4	60.2
	5 882	59.7	59.3	59.3
	6 034	62.2	59.3	60.2
	5 797	52.5	57.9	60.2
	5 861	55.9	60.2	59.7
Average for group I.		56.8	58.8	59.9
II	6 042	55.4	60.2	61.7
	5 795	58.8	61.7	61.2
	6 171	68.0	61.2	61.2
	6 111	56.4	62.2	61.7
	5 869	57.8	62.7	61.7
	6 315	67.5	61.7	62.2
	6 036	64.1	61.2	64.1
Average for group II.		60.6	61.6	61.5
III	6 035	64.6	63.1	62.7
	6 082	61.2	66.0	62.7
	6 318	63.1	62.7	63.1
	5 860	63.1	65.5	65.1
Average for group III.		62.0	64.3	63.4

On examining this table, it is seen that the « anatomical coefficient » is a transmissible and constant character. The maximum values of the first group remain noticeably inferior to the minimum values of the second group and so on.

Comparing group I with groups II and III we have:

	1909	1910	1911
II	+ 3.8	+ 2.8	+ 1.6
III	+ 5.2	+ 5.5	+ 3.5

The anatomical character « length of the openings of the stomata » allows also the identification of distinct anatomical races, which present different grades of xerophily. Many of these races have been isolated at Ivanov. When the races have been isolated, there follows the no less interesting work of making researches concerning the « *stability of anatomical races* », in spite of changing cultural conditions.

In 1911, many experiments were made to determine the action of moisture in the soil upon the structure of plants of different degrees of xerophily.

The experiments were made in pots of earth manured with acid sodium phosphate, sodium nitrate and potassium sulphate, and the humidity was 16 %, 25 % and 35 %, that is minimum, optimum and maximum.

The leaves were removed from different levels of insertion and at four distinct points of the vegetative period: tillering, beginning of ear-formation, ear-formation, flowering.

The anatomical coefficients are given in the following table (the variety of wheat being in this case Arnautki) in a form which is comparable with the corresponding data concerning the plants grown in the open in 1909, 1910 and 1911 :

Distinctive Number of the pure line	*Field experiments*			Level of insertion of leaves	*Pot experiments*		
	Length of stomatic aperture in μ				Length of stomatic aperture in μ under humidity conditions		
	1909	1910	1911		Minimum 16 %	Optimum 25 %	Maximum 35 %
5 732	50.1	55.4	49.6	I	61.9	62.9	61.7
				II	54.9	58.8	55.9
				III	52.0	52.0	53.0
				IV	48.0	48.2	49.2
				Average	54.2	55.4	54.9
5 718	55.9	58.8	51.1	I	63.8	65.3	62.1
				II	58.5	63.1	58.0
				III	49.1	53.2	52.0
				IV	49.4	48.0	51.5
				Average	55.2	57.4	55.9
5 366	58.8	61.7	54.5	I	67.2	68.2	61.2
				II	57.5	60.2	—
				III	48.4	56.8	55.9
				IV	50.3	50.3	52.0
				Average	55.8	58.8	56.3

The constant relation between the different grades of xerophily, which were observed in the field, was preserved and repeated even under the most varying conditions of soil humidity.

Thus in line No. 5732, with a minimum amount of moisture (16 %) the aperture is about 1.6 μ larger than in line No. 5366 (54.2 : 55.8) and it retains this ratio also with a high degree of moisture, having in fact 54.9 against 56.3 (= 1.4).

Such distinct anatomical races as can be isolated and are based on structural characteristics, remain distinct, even under varied conditions of environment.

907 TALANOFF, V. **Experiments in the Selection of Maize in Russia.** (Ispitanie, Ulutescenie, i Selekziia Sortov Kukurusi). — *Iux Russkaia Selskokhosiaistvennaia Gazeta* (South Russian Agricultural Review), No. 10, pp. 10-14; No. 11, pp. 7-10. Kharkov, Mart 1912.

Russia

The year 1911 is the fourth season of the experimental plots organised by the Zemstvo of the Government of Yekaterinoslav for conducting collective experiments; these have finally been converted into a veritable network of experimental stations with permanent management and staff.

Since 1910 these stations have been very actively engaged in the work of acclimatisation and improvement of the most valuable American varieties of maize and the selection both of these and the local varieties. With the object of obtaining an acclimatised and approved seed material, special plots were laid down for selection isolated and far away from each other, in order to avoid the consequences of cross-fertilisation. The greater part of the grain harvested is used as material for selection and for further experiments, the rest being sold to all comers.

The following varieties were in particular the subjects of study and investigation:

1. The local Grushevska, in order to obtain the maximum yield in a plant with highly developed ears.
2. Sterling, selected for obtaining an abundant crop and early maturity.
3. Leming and Minnesota No. 13 for maximum precocity combined with good crop.
4. Browncounty for maximum yield.

The work of selection is conducted on the following method: The best ears gathered in the field are, after determination of the weight, percentage of grain and germinating capacity, prepared for sowing in a special plot, with the caryopses of each ear sown in a single row separately. To avoid cross-fertilisation, pollarding of the plants is carried out in every second row.

The yield of each row is valued and studied separately. It is thus ascertained which are the best rows on the plot, and these serve for the subsequent work of selection. Thus it has been found that caryopses of the same variety but originating from different ears may present anything but a uniform degree of productivity, even when the parent ears are identical both in external aspect and in germinating power.

There are ears the yield of which is far above the average, and this character being very often transmissible, the possibility arises of considerably improving the variety by the isolation and improvement of the most productive and earliest stocks.

From the results obtained during these two years of experiments the possibility emerges of increasing the precocity of Leming and Sterling and augmenting their yield, and likewise increasing the yield of the native variety Grushevska. With regard to this latter, the best results in point of crop are obtained from seed material producing a progeny with well developed ears but ripening late.

In addition to these experiments in selection, attempts were also made at hybridisation between the varieties Leming and Grushevska sown in alternate rows; the results hitherto obtained do not allow as yet of forming definitive conclusions.

TALANOFF, V. **Varieties of Sorghum for Seed and Forage.** (Sorgo na Seleini Korm i Semó). — *Juxno- Russkaia Selskokhosiaistvennaia Gazeta* (Agricultural Review of S. Russia), 1912 Goda, No. 14, pp. 8-12. Kharkov, Apriel 1912. **908**

Russia

This paper contains an account of the selection experiments carried out at the Experimental Stations of the Government of Yekaterinoslav with the object of obtaining varieties of sorghum for seed and for green forage. At the same time, observations were made to determine the effect of side branches on the yield.

Seed varieties of sorghum. During four years (1908-1911) about 20 varieties were cultivated and studied. In 1911, the atmospheric precipitation was very great, but the low temperature during the summer, especially in the northern zones, retarded the ripening of early varieties.

The effects of low temperature were especially noticeable at Annov, where the dura did not ripen at all, and it was stated that in the other varieties (with the exception of Gaolian) the greater proportion of the seed was in the cheesy state of ripening.

In other districts (Irghen, etc.) all the varieties matured but contained a more or less high proportion of cheesy seeds. On the whole, during the whole experimental period, the best results, from the seed point of view, were obtained with the Black Dwarf Grushevsk Sorghum, which in 1910 produced 3 602 lbs. per acre, and in 1911 2 803 lbs. per acre. This kind of sorghum is distingueshed by its maturing sufficiently early, even in very cold summers. The others are too late to be recommended for the Government of Yekaterinoslav. The Gaolian varieties are very early, but their yield is only half that of Black Grushevsk.

In 1900 they produced 2137 lbs. per acre, and in 1911 1909 lbs. As for the feeding properties of the varieties of sorghum grown, when the product of 1909 was analysed at Irghen, it was found that certain varieties (doura, white Gaolian and Djugar) differed little in composition from maize.

Their starch content varied between 60 and 64 % (in the best varieties of maize the proportion does not exceed 68 %), and with an equal amount of nitrogenous matter, the cellulose content is rather low. Such varieties are therefore as suitable as maize for making alcohol ; this fact is known and made use of in the local industries.

The presence of side branches increases the yield in the case of dry seasons, but in very wet years they have a contrary effect.

Sorghum for green forage. In 1911, in spite of the low temperature, there was an excellent harvest on account of the abundant rain. Of the two meteorological factors, temperature and humidity, the latter, without doubt, is the more important.

In fact, in all the districts, the crop was in distinct proportion to the total rainfall in the months of May, June, July and August.

The most productive variety in 1911, and also on an average during the four years, was the Sweet Orange Kansas, which produced 10 tons 13 cwt. per acre of green forage; next came Early Sweet Iantar, with 9 tons 11 cwt.; then the Kaffir varieties with black glumes, which are to be recommended for their noted resistance to drought, and which yielded 7 tons 18 cwt. per acre.

With regard to the early ripening of varieties of sorghum, it is interesting to notice the connection between the rainfall and the productivity of the different kinds. During the years of the heaviest rainfall (1910, 1911), or on the most humid plots (in the same year), at Annov and Irghen, the best results were obtained with late varieties (Orange Kansas). In dry seasons or on drier plots, the early varieties such as Early Iantar came to the fore. In order to ensure abondant forage crops throughout the summer, two varieties of sorghum should be sown. A very early kind, Iantar, which can be first cut at the beginning of July, and a rather late kind which yields well, such as Orange Kansas, which can be cut for the first time at the end of July.

In a very dry summer, the sowing of Kaffir is to be recommended, for this variety remains green and luxuriant till the second half of August, even with a high temperature and scanty rainfall.

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Maxwell, F. The Selection of Sugar Cane with a View to Regenerating and Improving Cane Varieties. — *Bulletin Agricole*, 3^e année, No. 27, pp. 685-695. Port Louis (Ile Maurice), Mars 1912.

Mauritius.

The author treats briefly of the various methods of selection of sugar cane, which differ widely both as to the principles on which they are based and as to the results which they have produced.

Selection according to weight of cane.

This method is based upon the proposition — proved by experience — that the thickest and heaviest canes are as a rule the richest in sugar. As the weight of the cane generally corresponds to its specific gravity, which in its turn is in close proportion to its sugar content, it follows that the above ratio usually comes true.

The method consists in weighing either entire stools or separate stalks, after removing the adhering soil and dirt.

However, very great care is required in the practical application of this method. It frequently happens that heavy and apparently well constituted stalks show a poor yield in sugar owing to a high water content, and these canes must be rigorously eliminated.

Selection according to high sugar contents.

This method consists in determining the sugar contents of the juice extracted from likely canes. The great objection urged against this method is that no account is taken of the juice content of the cane; moreover the technical difficulties attendant upon its application render it often impossible in practice or make its results unreliable.

Selection according to specific weight of cane tops.

Both the sucrose and the juice contents of the cane vary according to its specific weight. It is therefore concluded that with normal canes of the same variety, the greater the specific gravity of a cane top, the greater the amount of juice which the cane contains and the higher the sugar content of that juice. Great care, however, must be taken in the application of this method lest it lead to fallacious results.

The outer rind of the cane has a solid structure and has a higher specific gravity than the central parts, which at times may contain much air. Thin stalks have comparatively more outer rind, whence they may possess a higher specific gravity. So that it often happens on application of this method of selection that thinner tops produced by lighter and less rich stalks may be classed with thicker ones and with those richer in sugar.

Combined selection.

From the various processes mentioned above it may be concluded that:

1. As a rule the properties of vigorous and sound cane tops are transmitted to their progeny.
2. The descendants of cuttings from primary stalks are usually more resistant to diseases than those obtained from shoots.
3. The heaviest stalks are generally the richest in sugar.

Based upon these propositions the selection of cane cuttings is applied as follows:

At the time of harvesting. vigorous and sound canes are selected according to their general appearance and from them tops of 10 to 12 joints are cut. Subsequently a selection of mother stems and shoots is applied. The best of both kinds are then separated from the leaves and again cut, stopping where the leaf gives some difficulty in separation (near the top). The last cut must be performed with great care as it must be a clean cut and not a shattered one. This is the weak point of the cutting and the road by which parasitic fungi and insects may attack the cane.

The second stage now begins. It is based upon specific gravity. In one part of the selection shed mother stems are treated; in another shoots. In each there is a set of three tanks, containing solutions of molasses of different density. The specific gravity of the tops under selection is tested by a simple process of immersion into the molasses solutions; the lighter tops will float at each stage; the heavier ones will sink. The tops are thus divided into " floaters " and " sinkers ". The specific gravity, as said above, is under normal conditions proportionate to sugar content. In addition it serves as a test of the soundness of the tops since it is proved that many diseases produce the effect of diminishing the specific gravity of the cane.

The tops are immersed into the first tank in which the molasses solution has the highest density: the " sinkers " are at once set apart for planting.

The "floaters" from the first tank are next immersed into the second tank, again the "sinkers" are set apart for planting, but separately from the "sinkers" of no. 1, and the "floaters" are transferred to tank no. 3. Here also the "sinkers" are reserved for planting, separately from those of nos. 1 and 2 and the "floaters" are sent off to the mill.

The difference in specific gravity between the several tanks is generally taken to be 4° Brix.

The determination of the minimum density of the solution to be used for the ultimate elimination varies especially according to the more or less abundant supply of tops available. When this is limited the final solution will be of lesser density.

In Java practice the density of the final solution usually ranges from 6° to 10° Brix.

The cuttings are plunged into a solution of Bordeaux mixture after which they are ready for planting.

TRUELLE, A. **Selection and Improvement of Apples in Normandy.** (L'évolution rationnelle de la Pomiculture Cidrière Normande). *La Vie Agricole et Rurale*, No. 11, pp. 425-428. Paris, 16 mars 1912. **910**

France

Two factors have hitherto ensured Normandy the leading position among the apple and cider producing regions in France. In the first place local conditions: extraordinary fertility of the soil, kept cool by numerous streams of water, surface configuration, etc., which appear to constitute the ideal habitat of the best and most reputed varieties. In the second place the work brought to bear in times past by cultivators and students who, aware of the great economic importance of this industry to their country, devoted their labours and investigations to the selection, improvement and spread of the best varieties. This rational system of cultivation, neglected latterly, is once more made obligatory by the formidable competition of other producing centres which have been developing in France (Maine, Brittany, Sarthe) and abroad.

Apple-growing in Normandy must undergo transformation and evolution in order to be able to co-operate in the satisfaction of two economic needs: the one, of long standing, the export of apples for cider to Germany, the other, of recent origin but capable of development into a great industry: apple drying. This necessary evolution is grounded on two distinct bases: (1) the transformation of the existing orchard; 2) the creation of mixed or special orchards.

Transformation of existing orchards. The process must be effected by way of elimination and limitation based on selection, the object of which must be to produce: 1) trees of high yield, healthy and vigorous, adapted to the classes of soil and climatic conditions of the particular region: 2) various types of fruits of different morphological, chemical and physical characters, so as to be able to serve for the most varied industrial applications.

The solution of the first part of the problem would require an experimental station, in which the best varieties should be cultivated under different conditions of climate and soil.

With regard to the second, among the élite varieties selected there should appear fruits of acid, bitter and sweet quality in sufficient quantities to allow of the creation of as many classes of ciders.

The creation of new mixed or special orchards. With still further extension of the area of cultivation of the apple tree, the new orchards could be mixed, that is, made up in a proportion to be determined, of varieties for export and varieties for drying ; or special, that is, comprising exclusively one category or the other.

Varieties for export. German buyers give preference to fruits of a tart flavour, medium sized and red or greenish-red in colour. Varieties of this type are not at present found in Normandy, whence they were banished three quarters of a century ago, but could be introduced from the neighbouring Brittany, which possesses many very valuable ones, such as Aigre Bihan, Bon Valet Rouge, Gilet rouge, Jambe de lièvre, Locard, etc. There might also be introduced with advantage the Rouge de Treves, pre-eminently the cider apple of the Rhenish provinces.

Varieties for drying. Preference should be given to those producing non-watery fruits, *i.e* not containing more than 75-80 % of water, with rough skins and greyish red in colour, as for instance Rousses Latour, Citron, and Binet Blanche.

CEREAL AND PULSE CROPS.

911 PÉTERFY TAMÁS. **The Varieties of Hungarian Maize.** (Magyar kukoricza fajták). — *Köztelek,* Ann. XXII, No. 27, p. 985 ; No. 30, pp. 1124-1125. Budapest, April 6 and 22, 1912.

Hungary The Hungarian agriculturists are making preparations for a National Maize Exhibition and the writer takes this occasion of describing the varieties of Hungarian maize cultivated by selectors. He begins with the Laposnyak maize, selected and cultivated by M. Lázár László de Csiktaplocza at Laposnyak, Hunyad Comitat.

1) *The Laposnyak Maize.*

The fixing of this variety is the result of 28 years of work and of pecuniary sacrifice, its development being slow, but for this reason more certain.

It was cultivated in a part of Transylvania, on the banks of the river Maros, where the principal food of the people is not bread, but polenta.

That is to say, that the cultivation of maize as an article of food was important, all the more so as the soil was very suitable. Consequently maize reaches there a higher price than in Budapest, where it is only used and sold for feeding live-stock.

M. Lázár has succeeded in producing a maize with smooth grain suitable both for human consumption and for live-stock.

He tried especially to obtain fairly soft grain giving an abundant flour with a good flavour, and at the same time, a stalk which would yield good forage for the cattle, as maize stalks form the basis of feeds in this country. For this it was necessary to aim at luxuriant vegetative growth together with early maturity, as wheat is often grown after maize. M. Lázár has also succeeded in obtaining a good proportion of weight of grain to cob, which is no easy matter.

He began his experiments in 1884, with 16 varieties, of which 6 only suited the soil, *viz.* Comptor, Ladreth, Pennsylvania, Longfellow, Duttenkorn and Prairie.

In 1887, after crossing, he obtained some ears with the help of which he was able to continue the work of selection in 1888, thus creating the Laposnyak maize, which inherits the tall stalk of the Pennsylvania variety and the flat long grain peculiar to the Horse-tooth variety. The ear, which is of a reddish yellow, is 30 cm. (11.7 in.) long and has 8 rows of seeds which completely cover it. It gives an abundant flour of good flavour. The ear when scarcely ripe and still tender is excellent cooked.

The preserving factory at Déva has used no other variety for years. Topping is easy as the stalk is brittle; shelling is also a matter of no difficulty. The Laposnyak maize yields an excellent fodder. A very thin ear is desired, which can resist the maize moth (*Leucania zeae*). In seed selection, empty cobs which cannot pass through a ring 20 mm. (0.8 inch.) in diameter are rejected, as their seed is then useless for reproduction.

The April sowings ripen in September and those of May in October. In gathering the crop the ear is broken off at its insertion on the stalk; this is done before the ears are completely dry, as they reach maturity before the stalks and leaves wither, and these afford a good green forage.

Sowing is done in lines 20 to 24 inches apart, by preference in light soil, but if necessary in heavy. In 1911, the average yield was 2 096 lbs. of grain per acre.

The Laposnyak maize succeeds everywhere in Hungary, except in dry sandy soil, for which indeed M. Lázár did not intend it.

2. *Bánkut Maize.*

This variety was obtained by M. Baross László, the Inspector of the Archducal Domain at Bánkut, comitat of Arad.

The American variety Prairie Queen, which was used as a basis, has some defects; the grain is small, the straw too light, the cobs are soft, and are too heavy compared with the grain; finally the bushel weight is insufficient. It was necessary to improve this variety and make it ripen earlier. Since 1895, when he began his experiments, M. Baross has made numerous crosses, and has succeeded in eliminating these defects and in obtaining, after 8 or 9 years, a variety which reproduces only the good qualities of the varieties used in crossing (Pignolet, Bristol, Mastodon, and Caragua or Horse-tooth). He succeeded in getting it to ripen two weeks earlier, increased the bushel weight by $^3/_4$ lb. to 1 lb., and also increased the proportion of nutritive matter.

The variety Bánkut thus obtained is of an orange colour and reproduces all the good qualities of the Horse-tooth variety. M. Baross has continued improving it.

To increase the proportion of seed to cob, he measured every year 15 000 to 20 000 dried cobs of the selected plants, sorted out the cobs which gave the highest proportion of seed, and sowed them. Thus he has obtained the proportion of 82: 18 between the weight of the seed and that of the rachis, a proportion which has even reached 88: 12, and in cobs selected for reproduction, 92: 8.

Bánkut maize threshed in the spring of 1911 gave an average of 87 to 89 of seed to 13 to 11 of rachis.

This variety should be planted in squares in good soil. As the plants reach 6 to 9 ft. in height they should be planted further apart than those of other kinds; it has been found that 27 inches is the best distance, but 24 inches is probably sufficient on less fertile soil.

Bánkut maize is sown in the middle of April and ripens towards the 10th of September. The average yield in the ten years is

3 410 lbs. of grain per acre ; the crops vary according to climatic conditions from 2000 to 4400 lbs. Thus during the extraordinary drought of 1911, the yield was only 2300 lbs.

The experiments of M. Baross have shown that placing several plants in one hole is not a good method of growing the Bánkut variety in the dry climate of the plain of Hungary; but he recommends the trial of this system in districts where the rainfall is more abundant, on squares of 31 to 35 in. Bánkut maize is very suitable for forage in damp mountain districts. Thus in the Imperial Domain of Bohemia 5 to 10 tons are ordered annually. This variety is more grown every year in Hungary ; in 1911 alone, 32 ½ tons of seed was sold.

During the last two years, it has also been grown in Croatia. This country took 1 ton of seed the first year and 10 tons the second year.

FORAGE CROPS. — MEADOWS AND PASTURES.

RICHARDSEN. **Systematic Experiment on the Yield of Marsh Pastures in North Friesland in the Summer of 1911.** (Die Durchführung einer planmässigen Weidekontrolle und deren Ergebnisse auf Nord-friesischen Marschweiden im Sommer 1911). — *Deutsche Landwirtschaftliche Tierzucht*, 16. Jahrgang, No. 15, pp. 169-172. Hannover, 12. April 1912. **918**

Germany

The Author reports the results of investigations which have been carried out for many years upon the yields of some low-land pastures in Germany, with the object of ascertaining, by weighing the grazing cattle, the production of live weight per acre (1). The animals are weighed on being turned into the pasture, ten days later, and when they are turned off. As most animals lose weight during the first few days the readings registered on the 10th day are considered as the initial weights.

The following table is an extract of the weights observed on a pasture 6.27 acres in extent:

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(1) See *B*. May 1912, No. 794.

Number and kinds of animals	Weight at beginning of experiment		Weight at end of experiment		Increase of live weight	Production of the pasture				
						total	per acre			
	Date	cwt.qr.lb	Date	cwt.qr.lb		1911	1911	1910	1909	1908
					cwt.qr.lb	cwt.qr.lb	cwt.qr.lb	cwt.qr.lb	cwt.qr.lb	cwr.qr.lb
1 Ox. . .	14 V.	8. 1. 20	1 X	11.0.20	2. 3. 1	23.3.24	3. 3. 7	4. 3. 2	4. 2. 24	4. 3. 1
» .	»	8. 2. 25	1 IX	11.2.22	2. 3 25					
» .	»	8. 1. 24	1 X	11.2. 4	3. 0. 8					
» .	»	8. 3. 5	1 X	11.3.13	3. 0. 8					
» .	»	7. 3. 7	1 IX	10.2. 8	2. 3. 1					
1 Calf .	»	2. 3. 18	15 VIII	4.3.21	2. 0. 3					
» .	»	2. 3. 23	»	4.2.14	1. 2.19					
» .	»	3. 3. 5	»	6.0.14	2. 1. 8					
3 Sheep .	» together	5 1. 20	1 VII	5.3. 9	0. 1.16					
6 Lambs.	»	2. 3. 1	1 VIII	5.2.19	2. 3.18					

The object of this weighing is to find out the most profitable number of head to turn into a pasture under normal conditions. The increase of live weight per head is not the chief consideration for the best utilisation of a pasture, as this depends also upon the number of animals, their age, individuality, breed and preparation as well as on the quality of the pasture itself. This is shown by the following table, which, as well as the other figures here given, refers to an estate in North Friesland.

Year	Stock in early summer initial weight per acre cwt. qr. lb.	Increase per ox cwt. qr. lb.	Number of oxen for the whole period of grazing
1908.	8 2 20	3 2 22	34
1909.	8 3 14	3 3 5	34
1910.	10 0 0	3 1 21	15
1911.	8 1 6	3 2 4	18

The year 1910, notwithstanding its abundant growth of grass, gave thus, owing to too heavy stocking, a smaller increase of live weight than the dry year 1911.

The too heavy stocking of pastures is often the cause of small profits.

918

BARTOLOZZI, O. **The Improvement of Pastures in the Apennines of the Modena District.** (Per il miglioramento dei pascoli dell'Alto Appennino Modenese). — *Le Stazioni sperimentali agrarie italiane*, Vol. XLV, Fasc. 1, pp. 76-86. Modena, 1912.

Italy

The plain of Mocogno, which is situated at an altitude of 1400 metres (4600 ft.) is composed almost entirely of pastures. These are at present largely covered with moss and weeds.

In order to study the method of improving them, experiments were begun in 1908 on four plots.

Plot No. 1. Experiment of complete renovation: removal of the turf, resowing and manuring.

The resowing was done with 54 lbs. per acre of the following mixture:

Alsike clover	1	lb.
Bird's-foot trefoil	1	»
Perennial rye-grass	3	lbs
Cocksfoot	2	»
Sheep's fescue	3 ½	»
Upright brome	3	»

The manures used were mineral superphosphates, 5 cwt. per acre, sulphate of potash, 2 ¾ cwt., and sulphate of ammonia, 2 ¾ cwt.

Sowing was done on June 15th, and was preceded and followed by light harrowing. The superphosphate and potash were spread at the same time, while the sulphate of ammonia was put on as a top-dressing on September 3rd.

Plot No. 2. Experiment consisting of harrowing, resowing and manuring.

Plot No. 3. Experiment consisting of harrowing and manuring.

Plot No. 4. Experiment consisting of a single harrowing carried out on June 15.

These various experiments have shown the superiority of complete renovation.

Plot No. 1 gave the best economic results. The first year, this plot was not grazed so as not to hinder root development. In 1909, the grass was cut twice and gave 2 tons of hay per acre. The average production of the pastures in their present condition is only 2 ½ cwt.

In 1910, the hay crop was 41 ½ cwt.

The two leguminous plants, alsike and bird's-foot trefoil, developed well, as a result of a liberal application of phosphoric acid.

Amongst the grasses, cocksfoot did not do well, although it is very abundant in the neighbouring pastures of Piandelagotti, growing naturally. This is probably due to the quality of the soil, which is damp and deep at Piandelagotti, while it is dry and light in the plain of Mocogno. The other grasses developed rapidly and regularly.

With regard to the expenses of renovation and annual expenses of up-keep (harrowing, cleaning, application of manures) the following figures can be given with regard to Plot No. 1 (area 1785 sq. yds.):

1. *Pasture renovation.*

		s	d
Three days for paring		7	2
One and a half day for harrowing		4	0
One day for sowing and spreading manure		2	4
Seeds		17	6
Phosphatic manures		7	2
Potash »		12	0
Nitrogenous »		16	0
Total	£3	6	2

This comes to £8,19*s* 3*d* per acre. To this sum must be added 12*s* for the redemption of the capital after 25 years.

2. *Annual Labour.*

	s	d
Harrowing	4	0
Spreading manures	—	7
Phosphatic »	2	2
Nitrogenous »	4	9
Total	11	6

This is £1,11*s* per acre.

The economic results obtained are very satisfactory and Sig. Vincenzo Ferrari-Amorotti, the owner of the plots subjected to the experiments, is going to renovate his pastures over an area of 57 acres.

FIBRE CROPS.

914 **United States: North Carolina**

BURGESS, J. L. **Cotton Culture in North Carolina.** — *Bulletin of the North Carolina Department of Agriculture*, Vol. 33, No. 2, pp. 1-36. Raleigh, February 1912.

The types or species of cotton grown in the United States are *Gossypium herbaceum*, or short staple cotton, and *Gossypium barbadense*, or long staple cotton, known generally as Sea Island cotton.

The yield of lint from the Sea Island cotton is much less than that from the short staple variety, but the uses to which it is put, together with the comparatively small amount that can be grown, cause the prices to range high enough to compensate generally for its lower total yield per acre.

The production of cotton in North Carolina has gradually increased since 1801 as shown in the following table:

1801	8 000 bales	1860	145 514 bales
1811	14 000 »	1870	144 935 »
1821	20 000 »	1894	479 441 »
1826	20 000 »	1900	502 825 »
1834	19 000 »	1910	675 000 »
1850	73 845 »		

During the last five years the average acre yield in North Carolina was higher than that of Texas, South Carolina, Georgia, Florida, Alabama, Mississippi, Lousiana, Arkansas or Tennessee as may be seen from the following table:

Average acre yield (in lbs) of Cotton.

State	1906	1907	1908	1909	1910
North Carolina .	210	205	211	210	227
Texas	225	130	196	125	149
Louisiana	272	210	145	130	130
Arkansas	215	195	215	153	175
Tennessee.	180	190	218	158	198
South Carolina .	175	215	219	210	212
Georgia	165	190	190	184	174
Florida	95	115	112	110	110
Alabama.	165	169	179	142	158
Mississippi	215	228	233	157	173

Cotton is grown with more or less success on all soils of the foothill region. The short season for cotton in this section is largely compensated for, however, by the perfect surface drainage of the soils. In the clay and loam belts no system of cotton culture can be counted safe that does not provide for the incorporation of a liberal amount of organic matter or humus in the soil each year. The use of a liberal amount of stable or green manure is entirely necessary. And besides the use of stable manure or green manure as the basis of fertilisation of these soils, artificials should be used at the rate of 400 to 600 lb. per acre.

In the foothill section the rotation must be chosen with a view to adding organic matter to the soil each year. Consequently the old three year rotation of cotton, maize and small grain is good, with a slight modification, namely, sowing rye or crimson clover in the cotton field and ploughing it under before maize is planted. Peas or soy beans, sown broadcast, should follow the small grain crop, and be cut for hay or ploughed under according to the need of humus of the land.

In general this rotation will suit the coastal regions, except that as a rule oats should be substituted for wheat.

The unusually high percentage of lint yielded by some varieties in several counties during 1911 is given in the following table:

Variety	County	Per cent Lint
Summerour	Iredell	48.5
Russell Big Boll	»	41.6
Excelsior Prolific	»	41.2
Toole	»	41.1
Bradbury's Improved	»	40.6
Brown No. 1	»	41.2
Hawkins'	Rutherford	41.1
Simpkins'	»	40.7
Webbcr	Wayne	40.5
Summerour	»	43.2
Morgan's climax	Columbus	43.3
Excelsior Prolific	»	40.3

The varieties that for a number of years have given the best results in the foothill section are Kings' Improved, Russell Big Boll, Thigpens' Prolific, Simpkin's Prolific and Brown No. 1.

The varieties that made the highest yields at the Edgecombe Test Farm during the past four to nine years were the Webber, Hodge, Russell, Big Boll, Edgeworth, Shine's Early, and Culpepper's Improved.

915

Püschel, Paul. **On the Returns of Flax-growing in Germany.** (Betrachtungen über die Rentabilität des Flachsbaues). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, XXVII. Jahrgang, No. 16, pp. 230-232. Berlin, 20. April 1912.

Germany

Owing to the high prices of flax in 1911, there is now manifest in Germany a strong tendency to increase the acreage under this fibre. It is therefore of interest to consider critically the following questions:

1. May high prices be expected also for 1912?
2. At what price for the raw fibre is flax-growing still profitable when the raw fibre is sold?
3. Is it advisable to work up further this raw flax or to sell it as soon as the price is profitable?

To the first question the answer may be given that in 1912 very high prices are not to be expected, because the prices of German Silesian flax are dependent upon the purchasing power of the Bohemian manufacturers who, considering the losses they incurred in 1911, will not, in the current year, even should the crop not prove abundant, buy except at a price that will leave some margin for profit, namely about 5*s* per cwt.

As to the second question, the author assumes the average yield per acre to be 28 3/4 cwt. of dry flax, 4 cwt. of seed and 5 ½ cwt. of husks. The expenses and returns per acre are then as follows.

Expenses.

	£	s	d
Average gross return of 1 acre	3	3.	6
Ploughing	—	2.	9
Furrowing	—	5.	6
Preparation for sowing, and sowing	—	11.	1
Seed	1	11.	9
Weeding and pulling	—	19.	1
Cartage of produce 45 ½ cwt.	—	11.	5
Combing the seed from the flax	—	8.	7
Cleaning the seed	—	4.	0
Carriage of flax to railway	—	8.	7
Cost and spreading of artificials	1	4.	8
Management	—	7.	11
Insurance	—	2.	9
Total	£10	1*s*	7*d*

Returns.

	£	s	d
4 cwt. of linseed at 12*s* per cwt.	2	8.	0
5 ½ cwt. of husks at 2*s* per cwt..	—	11.	0
Total. . . .	£2	19*s*	0*d*

In selling the raw flax the difference between these two sums, that is £7,2*s* 7*d*, must be recovered.

The raw flax must thus be sold, assuming the average crop to be 28.67 cwt. per acre, at about 5*s* per cwt. so as to give the average gross return of 63*s* 6*d* per acre.

Flax is thus a profitable crop even if the raw flax be sold at something less than 5*s* per cwt.

Flax growing yields the highest returns when the grower and the producer of fibre are the same person, that is to say when the grower himself works up the raw produce. The question of quality is all important with flax, and in order to establish the value of the produce the grower himself must prepare the fibre.

The old homely implements for working flax are now replaced by modern appliances. In the following calculations large installations which treat 30 000 to 40 000 cwt. of raw flax every year are considered.

In calculating the profit made by the producer in succcssively working the raw material, the yield per acre is taken at 28.67 cwt. worth about 5*s* per cwt. Flax combining high quality with heavy yield is not often met with: fine flax with a high percentage of fibre should be grown. In the following account of the industrial treatment of flax the amount of fibre is assumed to be 17 % and its value £2,19*s* 9*d* per cwt. The tow, worth 8*s* per cwt. is estimated at 5 %.

Expenses.

	£	s	d
Value of raw flax 28.67 cwt.	7	2	10
Labour for retting	—	14	3
Carriage	—	6	5
Scutching	—	6	5
Swingling	1	9	2
Packing and loading	—	6	3
General expenses	1	15	9
Total	£12	1*s*	1*d*

Returns.

	£	s	d
From 28.67 of raw flax:			
17 % fibre = 546 lb.	14	11	4
5 % tow = 160,58 lb.	—	11	5
Total . . .	£15	2*s*	9*d*

There is thus a profit of £3,1*s* 6*d* per acre. By working up the flax on the estate itself the gross returns per acre are nearly doubled, the price of the raw flax increasing by 43 %.

These data hold good for large estates and show the great importance of flax in modern farming, especially when the successive working of the fibre is carried out in the farm itself.

Cultivation, Preparation and Utilisation of Hemp and Hemp Seed (*Cannabis sativa*). — *Bulletin of the Imperial Institute,* Vol. X, No. 1, pp. 94-111. London, April 1912. **916**

The true hemp plant is *Cannabis sativa* Linn. It occurs wild in Central Asia and in cultivation in temperate and tropical regions of both hemispheres.

The term hemp is unfortunately applied, especially in statistical returns, to various fibres that have no affinity to true hemp, such as Deccan, Manila, Mauritius, New Zealand, Sisal, Sann or San, Tampico and other hemps.

The hemp plant adapts itself easily to diversities of climate and is found in cultivation in the tropics as well as in northern Russia.

Hemp is cultivated for fibre in most European countries, but most extensively in Poland and in southern European Russia, which are the chief hemp exporting countries of the world. It is also grown to a considerable extent in Germany, Austria-Hungary, Servia, France and Italy, the fibre produced in the last-named country being considered the finest in commerce. In England it is grown to a small extent on the cool moist alluvial soils of the east coast.

In Africa it is met with both on the east and the west coasts. In the United States of America its cultivation is found chiefly in the « blue grass » region of Kentucky and recently in California, Illinois and Nebraska.

In South America it is grown in Chile and Mexico.

It is widely grown in India. Its systematic cultivation is confined chiefly to the Himalayas at elevations of 3000 to 7000 feet. It is largely grown in China and Manchuria, and also in Japan.

The following table, so far as returns are available, shows the amount of seed and fibre produced in 1908 and 1909 for the principal countries where the systematic cultivation of hemp is practised:

	Seed		Fibre	
	1908 cwt.	1909 cwt.	1908 cwt.	1909 cwt.
Austria	267 005	283 796	383 622	350 952
Bulgaria	19 222	—	19 373	—
Chile.	9 994	—	11 840	—
France	149 124	—	275 972	—
Germany	—		—	
Hungary	397 476		1 037 368	
Italy	—		1 489 668	
Japan	—		168 700	
Roumania.	61 622		30 586	
Russia (European) .	—	9 852 555		9 100 480
Poland	—	89 043		81 679
Finland	—	—		—
Caucasia	—	82 497		118 363
Siberia and Steppes	—	525 600		442 974
Servia	—	—		—

Alluvial soils are well adapted to the hemp crop. The finest Italian hemp is grown on rich strong loams that have been brought into a friable condition by cultivation and manuring. The soil intended for hemp must be deeply ploughed and repeatedly harrowed to produce a fine surface tilth, and it must be heavily dressed with manures rich in nitrogen. Rotation with other crops is advisable and becomes especially necessary where the crop has been attacked by the root parasite *Orobanche ramosa.* The seed is sown broadcast for the fine hemp.

In Italy it is usual to lay the stalks in a fairly shady place for some days before retting.

Hemp is retted by three different methods, known as «water retting», «dew retting» and «snow retting». The first is practised in Italy and in parts of France either by still or running water. Dew-retting is generally adopted in the United States and in parts of France, but sometimes the fibre becomes retted unevenly and some of it may be over-retted; the third method, snow retting, is sometimes practised in Russia and in Sweden. In Japan the stalks are also submitted to the action of steam.

The yield of hemp amounts to about 25 per cent of the dry stalks, and the product furnishes about 65 per cent of spinning fibre, the remainder being obtained in the form of tow.

The commercial value of hemp depends to a large extent on the colour and the lustre. The nearly white and pale grey are regarded as the best. The best hemp is the Italian, especially the Bolognese product; next to Italian hemp stands the French fibre, particularly that of Grenoble; Russian kinds are rather coarse but are of great strength and durability. The hemp of the United States generally resembles that of Russia.

Much of the hemp-seed of commerce is produced as a by-product of fibre cultivation. In the United States the hemp that is grown solely for seed is cultivated on specially selected land in river valleys, the greater part along the Kentucky river.

Hemp seed is used as a bird-seed and also for the production of oil and oil-cake. It usually contains from 30 to 35 per cent of oil.

European Russia exported the following quantities of hemp seed:

in 1908.	19 771 tons
» 1909.	9 102 »
» 1910.	6 307 »

and Hamburg imported:

in 1908.	1061 tons
» 1909.	582 »
» 1910.	4589 »

Russia exported. principally from Libau, 47 290 tons of hemp-seed cake in 1910.

Hemp-seed oil is of a light green or greenish-yellow colour when freshly extracted, but alters to a brownish-yellow on keeping.

It has the following constants:

Specific gravity at 15° C.	0.925 — 0.931
Saponification value.	190 — 193
Iodine value, per cent.	141 — 166

It is used for the manufacture of soft soaps, paints and varnishes.

In the following table the percentage composition of hempseed cake and meal is compared with that of other feeding cakes in common use:

	Water	Ash	Fat	Proteins	Carbohydrates	Crude fibre
Hempseed cake	12.55	7.85	8.30	32.38	16.02	22.90
» meal	11.75	9.25	1.73	34.75	16.82	25.70
Cottonseed cake decorticated . .	9.00	7.10	11.38	43.78	23.56	5.18
» » undecorticated.	13.75	4.60	6.56	24.62	29.28	21.19
Linseed cake.	11.16	5.20	9.50	29.50	35.54	9.10
Soy bean cake.	12.70	5.05	11.07	38.82	26.51	5.85

Hempseed cake is used for feeding cattle, and should form a nutritious food, although the amount of crude fibre is somewhat high.

917 Hibiscus from the Gold Coast and the Philippines.

Hibiscus Fibres from the Northern Territories, Gold Coast. — *Bulletin of the Imperial Institute,* Vol. X, No. 1, pp. 51-55. London, April 1912.

WESTER, P. J. Roselle, its Cultivation and Uses. — *Philippine Agricultural Review,* Vol. V, No. 3, pp. 123-132. Manila, March 1912.

Gold Coast Philippines

The Imperial Institute (London) has examind three samples of three varieties of *Hibiscus* fibres from Tamale, in the Northern Territories of the Gold Coast. Nos. 1 and 2 were obtained from plants cultivated at the Agricultural Station, No. 3 was prepared from wild plants. For the two first samples it may be noted that the plants ripen seventeen weeks after sowing. The yield is about 600 lb. per acre.

The three varieties of *Hibicus* are cultivated on a large scale by the natives and their cultivation might still be greatly extended and give rise to considerable exportation.

Sample No. 1 was *Hibiscus Sabdariffa* Linn. The chemical analysis of this fibre compared with that of very fine Indian jute has given the following results:

	Hibicus No. 1 —	Extra fine Indian jute —
Moisture per cent	8.9	9.6
Ash	1.1	0.7
Loss by hydrolysis α. . . .	12.3	9.1
« « « β. . . .	17.8	13.1
Loss by leaching with acids	1.5	2.0
Cellulose	73.9	77.7
Length of fibre	8 to 16 inches	6 to 16 inches

This fibre will find a ready sale as a substitute for *Hibiscus cannabinus* or Bimlipatam jute, The sample that was examined is not the usual cultivated *Hibiscus Sabdariffa* but one of its varieties.

Sample No. 2 was a type of *Hibiscus cannabinus* with relatively undivided leaves. The product of this sample was very glossy, greyish brown in colour, a tissue of not perfectly clean fibres, but somewhat gummy and consequently roughish, The value of this sample was inferior to that of the preceeding one.

Sample No. 3 was from *Hibiscus squamosus.* Its fibre was glossy, well cleaned, silver grey in colour, but also somewhat gummy and rough. The fibre is strong, about 40 inches in length and compares favourably with Calcutta «Daisee» jute. This *Hibiscus* was formerly believed to be *H. lepidospermus.*

All these three kinds of fibre are more easily broken than jute fibres.

There are several kinds of *Hibiscus* fibre which may be utilised as substitutes for jute or which may be woven with it. Among these, Indian *Hibiscus cannabinus* or Deccan Hemp which is imported into Great Britain under the name of Bimlipatam jute. — *Hibiscus esculentus* or " Okra " of West Africa has the disadvantage of being very uneven in quality; *Hibiscus lunariifolius* of Northern Nigeria, which produces " Ramma " fibre may also substitute jute.

Among the plants which may be compared, in trade, to jute, *Triumfetta cordifolia* var. *Hollandii,* from the Gold Coast may be mentioned as being equal to the best jute. It should be carefully studied from the agricultural as well as from the industrial point of view.

The roselle (*Hibiscus Sabdariffa*) was successfully introduced into the Philippines from Hawaii, Florida and Java. It is one of the few plants, of which the calyx is used as human food. It has long been cultivated in Mexico, in parts of Central America and the West Indies and of late years in Florida, in Texas and in California. In Queensland on 4 acres, 780 bushels of calyces were gathered.

It belongs like cotton to the Malvaceae and it somewhat resembles the cotton plant in its general aspect and it branches profusely. In rich soils the plant attains a height of six feet. There are two distinct types of " roselle ": one contains a red pigment which gives the characteristic brilliant red colour to all the products of the plants belonging to this type ; the other does not possess this pigment and all the parts of the plant are greenish, whilst the calyces are straw coloured or whitish. In the red type two varieties may be noticed : Victor and Rico. The first is more erect in habit than the second and earlier in fruiting. The calyces of the first are reddish, those of the second dark red.

The plants of the type bearing white fruit are of a more upright habit than the varieties of the red type, but they are not so vigorous and their calyces are smaller.

The plant grows rapidly and requires much moisture; nevertheless the soil must be well drained. It is very liable to *Heterodera radicicola* and land infested with this pest should not be planted to roselle.

The plants of the Victor variety in Florida yield an average of 12 lb. 5 oz. of first flowers and 3 lb. 12 oz. of second flowers. Plants of this variety set 8 or 10 feet apart, that is about 520 to the acre, produce about 75.6 cwt. of calyces per acre. In Hawaii the crop of calyces ranges from 53.7 to 62.7 cwt. per acre.

From the calyces, jellies and preserves are manufactured. With the fruit of the white type wines and sirups are made. In India " roselle " is cultivated to some extent for its fibre, and it is as a fibre plant that *Hibiscus Sabdariffa* might be taken into consideration in the Philippines. If roselle were cultivated on a large scale, the stems, which contain a strong fibre, might be utilised in the manufacture of paper and thus become a source of profit instead of being an expense to the farmer who has to remove them to make room for another crop.

The only cryptogamic disease which attacks *Hibiscus Sabdariffa* is *Oidium* which can be controlled by dusting with sulphur. *Oidium* has not yet appeared in the Philippines. — The most serious enemy of the roselle is the root knot nematode (*Heterodera radicicola*) against which no cheap and effective remedy has yet been found.

The cotton stainer (*Disdercus suturellus*) does some damage to the calyces, but seems to be of minor importance. Aphids that sometimes attack the young plants are readily controlled by the application of tobacco dust. Two scale insects (*Coccus hesperidum* and *Hemichionaspis aspidistrae*) have been recorded on the roselle, also a mealy bug (*Pseudococcus* sp.), neither, however, as a serious pest.

CROPS FOR SUGAR PRODUCTION.

CLARKE, G., ANNETT, H. E. and SYED ZANIN HUSSAIN. **Experiments on the Cultivation of Sugar-Cane at the Partabgarh Experimental Station, 1909-1911.** — *Agricultural Research Institute of Pusa. Bulletin* No. 27, pp. 1-29. Calcutta, 1912. **918**

British India

The sugar-canes of Upper India differ markedly from the canes of other countries and demand very different treatment for their successful culture. The general conclusions holding good for the cultivation of varieties such as the Tanna and Bourbon canes, grown in Java, the West Indies and South America cannot be always applied to them.

Very little appears to be known about the behaviour of the thin Ukh and Ganna varieties under different conditions of cultivation, beyond the general conclusions arrived at by Leather, in an extensive series of manurial experiments carried out at Cawnpore and elsewhere, that without temperate additions of plant food, particularly nitrogen, to the soil, it is impossible to grow canes successfully; but that attempts to produce abnormal yields of cane by excessive doses of manure, which are profitable in the case of Pounda varieties, do not produce a commensurate increase in the weight of sugar per acre.

It was therefore necessary to study the effect of varying some of the cultural conditions on the character of the crop of cane in the United Provinces. Certain observations made during a preliminary survey of the canes grown at the Partabgarh Farm in 1908 showed that useful information could be derived by studying the effect of planting the sets different distances apart. By starting with a small number of sets per acre planted at wide distances apart, and gradually increasing the number of sets by lessening the distance, it might be possible to ascertain the optimal number of sets per acre and the optimal distance apart of the sets.

The cultivators in most parts of these provinces avoid risks due to imperfect germination and other causes by planting a very large number of sets per acre. Sometimes up to 40 000 per acre are planted in certain districts.

The experiments were conducted for three successive years at Partabgarh with the variety Reora of Benares. The following table shows the number of plots grown during the three years of the experiments, the number of sets planted per acre and the approximate distance between the individual sets.

1908-1909		1909-1910		1910-1911		
Plot —	Sets per acre	Plot —	Sets per acre	Plot —	Sets per acre	Distance of sets in inches
1	3 000	—	—	—	—	45.7
2	4 000	1	4 000	1	4 000	39.6
3	5 000	—	—	—	—	35.4
—	—	2	6 000	2	6 000	32.3
5	7 000	—	—	—	—	29.9
6	8 000	3	8 000	3	8 000	28.0
7	9 000	—	—	—	—	26.5
8	10 000	4	10 000	4	10 000	25.6
9	12 000	5	12 000	5	12 000	22.8
10	15 000	6	15 000	—	—	20.0
11	18 000	7	18 000	6	18 000	18.6
—	—	8	24 000	7	24 000	16.1

From the experiments it results that a full production is possible by planting relatively few sets (from 6 000 to 8 000 per acre). Planting less than 12 000 to 15 000 sets per acre involves considerable risk of losses of crop by imperfect germination and development.

These results in respect of cane are similar to those for the total yield of sugar, although an increase of weight of cane crop is not always represented by an increased production of sugar by weight. On the plot where 18 000 to 24 000 sets per acre were planted at a distance of 18 in. by 16 in. the crop was obout 7 tons per acre more cane than on the plot where only 12 000 sets had been planted, but the total yield of sugar was very nearly the same, the only difference being that the proportion of glucose to sucrose was greater.

The cane experimented on was crushed and yielded the following results in percentage of juice extracted for the three years under experiment :

Plot	Percentage of Juice extracted		
—	1908-09	1909-10	1910-11
1	59.0	61.5	62.0
2	55.7	60.7	63,1
3	57.3	61.9	62.3
4	59.8	61.8	62.5
5	60.1	61.9	63.2
6	60.6	63.8	64.4
7	58.2	64 0	64,7
8	60.8	64.7	—
9	61,0	—	—
10	61.2	—	—

RUBBER, GUM AND RESIN PLANTS.

Rubber Resources of Uganda. — *Bulletin of the Imperial Institute*, Vol. X, No. 1, pp. 11-25. London, April 1912. **919**

Uganda

The important indigenous rubber plants of Uganda are *Funtumia elastica* and the two lianas *Landolphia Dawei* Stapf. and *Clitandra elastica* K. Schum. *Funtumia latifolia* Stapf. and other *Landolphia* lianas are also frequent, but have no importance as producers of rubber. Experiments in the cultivation of " Para " and " Ceara " have given promising results. " Castilloa " grows well, but it is too severely damaged by *Inesida leprosa*, an insect that causes much injury to rubber trees.

All the rubber hitherto exported was forest rubber, In 1908 plantations were commenced and by 1911 they occupied an area of 3 200 acres, about two thirds being Para.

The amounts of rubber exported from the Protectorate are shown by the following table :

Years	lbs.
1902-1903	68 626
1903-1904	45 809
1904-1905	51 970
1905-1906	42 718
1906-1907	73 191
1907-1908	34 530
1908-1909	47 738
1909-1910	105 909
1910-1911	101 352

Besides the above-mentioned rubbers, Uganda has also two species of *Chrysophyllum : C. Kayei* S. Moore, and *C. albidum* G. Don, which yield a product similar to inferior rubber.

On the various species of rubber plants and their produce in Uganda the following particulars are gfven.

1. PARA (*Hevea brasiliensis*). It grows well, and at Entebbe its cultivation has given excellent results.

The analysis of the samples examined at the Imperial Institute has shown the following compositions for the two types marketed :

	Crêpe Per cent	Biscuit Per cent
Loss on washing (moisture and impurites)	0.6	0.3
Composition of dry washed rubber:		
Caoutchouc	94.0	94.7
Resin	2.7	2.3
Proteid	2.9	2.3
Ash	0.4	0.7

Uganda "Para" is equal to that from the East, but it is not quite so strong, probably because it is produced by young plants.

2. CEARA (*Manihot Glaziovii*). The results of cultivation have been promising, but further experiments are required before a final judgment can be given.

The following are the results of analyses:

	Crêpe Per cent	Biscuit Per cent
Loss on washing	1.6	3.9
Composition of dry washed rubber:		
Caoutchouc	88.7	84.0
Resin	6.2	5.0
Proteid	4.3	9.3
Ash	0.8	1.7

"Crêpe" thus presents excellent qualities, whilst "biscuit" contains too much proteid matter.

3. FUNTUMIA (*Funtumia elastica*): It is found in all the forests of Uganda and especially in the Mabira forest. It is the principal source of rubber in Uganda. Analysis has yielded the following data:

	Per cent
Loss on washing	0.7
Composition of dry washed rubber:	
Caoutchouc	90.3
Resin	7.7
Proteid	1.7
Ash	0.3

Funtumia yields a very good rubber which is well prepared and dried, and its tenacity and elasticity are satisfactory.

4. LIANAS. Besides the afore-mentioned lianas, others are found in Uganda, but they have no importance as producers of rubber. The two best are:

a) " Nansali " (*Landolphia Dawei*). The analysis of this liana which grows more rapidly than any other has given the following results:

	Rubber Sheet Per cent	Rubber biscuit Per cent
Loss in washing	0.1	1.1
Composition of dry washed rubber:		
Caoutchouc	92.4	91.1
Resin	6.6	7.7
Proteid	0.8	0.9
Ash	0,2	0.3

b) " Kapa " (*Clitandra orientalis*). Results of analysis:

	Per cent
Loss in washing	0.6
Composition of dry washed rubber:	
Caoutchouc	84.8
Resin	6.4
Proteid	8.5
Ash	0.3

5. GUTTA of *Chrysophyllum*. This product, which resembles rubber, is obtained from the two species *Chrysophyllum Kayei* and *C. albidum*.

According to analysis they contain:

	C. albidum Per cent	*C. Kayeid* Per cent
Moisture	4.7	5.0
Resin	14.8	7.4
Substance similar to rubber	2.0	0.8
Matter insoluble in chloroform	78.5	86.8

The insoluble matter contains proteids and mineral substances. These analyses demonstrate the slight importance of these products.

The Cultivation of *Funtumia elastica* on the Christy System. 920

(Culture du *Funtumia elastica* ou Ireh d'après le système Christy).—*Bulletin du Congo Belge*, Vol. III, No. 1, pp. 208-213. Bruxelles, mars 1912.

Belgian Congo. Guinea. Uganda

The fundamental principle of the Christy system consists in planting the young trees in very close rows, so that the soil is always shaded, in consequence of which weeds are impeded in their growth, and the Funtumia trees shoot up high, forming straight trunks with tender bark, and without lateral branches. As the trees grow they are thinned out. The Christy System requires great attention for the prevention of cryptogamic diseases. The incisions for extraction of the latex are made by clean, narrow cuts, with breaks in them in the manner of a line of dashes. These dash-lines of incisions are traced out obliquely to the axis of the tree. The many breaks in the incisions allow of the constant circulations of the latex and promote rapid cicatrisation. The author of the system has made a prolonged study of Funtumia in Guinea and Uganda, and has now been sent on a mission to the Belgian Congo in connection with the cultivation of that tree.

According to the Christy System the Funtumia seed must be selected from trees having a high rubber yield. The nursery plants must be transplanted when they have grown two leaves, and generally as soon as possible, endeavouring to have them six months old when the rains set in. The seedlings may also be planted out permanently direct from the seed-bed, protecting them with grass or leaves supported by sticks.

The land to be used for plantation should be cleared of all small trees and shrubs, leaving the big trees. The distance between the Funtumia trees should be 5 ft. × 5 ft. or 6 ft. × 6 ft. As the rubber trees grow the large trees originally left standing are successively felled. This system obviates the heavy expense of clearing.

Thinning is effected according to the growth of the trees, which depends on environmental conditions. The year before removing the overcrowding trees it is desirable to tap them thoroughly so as to secure all they can yield. When the trees reach a height of six feet, the superfluous terminal shoots must be removed, keeping only the most vigorous one. Trees with double or triple trunks must be got rid of.

While Hevea is tapped every day or every second or third day, Funtumia is only tapped two or three times in the year, and not until its sixth year. Funtumia must be tapped from the ground up to as high as possible. The young trees about 6 to 8 years old are tapped twice a year, and, in a well-ordered plantation, should yield about 113 gr. (4 oz.) of dry rubber. Trees from 8 to 10 years of age are tapped three times a year, and those over 10, four times. The tapping should not be done during the rainy season.

According to Christy, well cultivated trees in good soil and in a favourable climate should yield the following results in point of production.

AGE . . . years	6	7	8	9	10
Girth . . . . (inches)	21	26	30	33	36
Height of the incision . . . . . (feet)	12	15	19	24	27 1/2
Number of tappings per year	2	2	3	3	3
Latex per tapping (cubic centimetres)	120	150	180	240	300
Dry rubber per year . . . . . (ounces)	4	5	9	12	15

The latex of Funtumia is coaguleted either by exposure to the air, or by boiling, or again by adding plant juices or chemical coagulants. Among the latter, the most effective are acetic acid, alcohol, tannic acid, corrosive sublimate and 40 % formaldehyde.

GOSSWEILLER, JOHN. **Balata, in Guiana, Venezuela and Angola.** (Balata - *Mimusops Balata*). — *Boletim de Agricultura da Provincia de Angola*, Anno I. No. 1, pp. 24-28. Loanda, 1912. **921**

Guinea. Venezuela. Angola

The genus *Mimusops* of the family of the *Sapotaceae* numbers about thirty species distributed in the tropical regions of both hemispheres. Five of these species are found in Angola, namely two in the coast region, two in the region of Cazengo and Golungo Alto and one in the region of Pungo Andongo and Malange. The coast and Pungo Andongo species are insignificant trees, only about 16 ft. in height. Those of Cazengo and Golungo Alto are well developed, leafy trees known by the native names of *Cafequesu* and *Quisunhunga*, and botanically as *Mimusops Welwitschii* and *M. frondosa*. The timber of these species is excellent, but every endeavour made to collect the latex has up to now been unsuccessful, owing to the large quantity of resin in it.

The only species of *Mimusops* producing balata are native to Jamaica, Trinidad, Guiana and Brazil. *Mimusops Balata* attains a height of 115 ft. and in addition to the latex gives an excellent wood. Balata trees are frequent on the slopes of the hills where moisture is greater. In Surinam the balata region is the district of Nickerie, and its industry is entirely native. The tapping is carried out between April and August every year under special licenses. The Government of Surinam every year grants about 500 000 acres for working.

Sometimes the natives in order to secure more latex use the very bad system of felling the trees. The incisions (herring-bone) are made from below upwards, one on each side of the trunk. These incisions must not cut into the cambium because the latter contains tannic substances which colour the latex. The latex runs for three hours. One workman can tap from six to eight trees per day, producing an average of 3 ½ to 4 ½ lb. of balata. The latex is gathered in the early hours of the morning. The tree can only be tapped every five years. The latex is allowed to stand in wooden vessels covered with palm leaves for two or three days so that it may ferment naturally. It is then subjected to a process of evaporation and coagulation lasting three days. When completely dried it is exported in blocks of 30 kg. (66 lb.).

Balata is a vegetable wax, a pseudo-rubber.

The exportation of balata for the principal producing countries in 1900, 1905, 1906 and 1907, was as follows (in kg.):

	1900	1905	1906	1907
Surinam . . .	—	—	270 000	384 000
British Guiana .	—	—	728 231	834 728
Venezuela . .	—	—	1 232 148	1 455 973
French Guiana .	4 000	16 000	—	—

Of late years experiments in growing balata have been made in the Botanical Gardens of Trinidad and Jamaica. The cultivation is not remunerative.

Seeds taken to the Experimental Garden at Cazengo (Angola) germinated with great irregularity. The cultivation of balata must be tried in Angola in the exceedingly wet regions such as Golungo Alto, Cazengo, Encoge and Amboim.

VARIOUS CROPS.

922 HENRY, YVES. **African Cocoa.** (Le Cacao Africain).
PRUDHOMME, EM. (Contribution à l'étude du Cacao de la Côte d'Ivoire). — *L'Agriculture Pratique des Pays Chauds*, No. 107, pp. 89-101; No. 108, pp. 189-203, 250-254. Paris, février, mars 1912.

West Africa

The West Coast of Africa in 1910 produced 70 000 tons of cocoa, almost one third of the world's production. The production is both insular and continental. In the former San Thomé and Principe appear with 36 000 tons and Fernando Po with 2 115 tons; in the latter the Gold Coast and Lagos account for 26 500 tons, Kamerun and Togo for 1 000 tons of native production. European plantations up to now have only yielded 1 000 tons in the Belgian Congo and Gaboon and 2 500 tons in Kamerun and Togo.

The insular production presents no great interest for the future; it has taken fifty years to attain to the importance it now possesses, and it may be assumed that in view of the few lands still available and the decreasing value of these lands the insular production will shortly reach its limit.

The future of African cocoa lies on the continent, which in twenty years has developed a considerable production and possesses an immense reserve of forests where the cocoa tree finds favourable conditions of development.

The following table gives an idea of the production of Cocoa in 1910 in tons, compared with the production of 1900.

	1900	1910
World's total	102 076	220 905
San Tomé and Principe	13 935	36 664
Fernando Po	—	2 115
Belgian Congo	—	906
Gaboon	14	115
Gold Coast and Nigeria	743	26 500
Kamerun	261	3 431
Togo	—	137
Dahomey and Ivory Coast	2.5	9
African total	14.955	69.877
African: world's total	14.6 %	31.5 %

In Kamerun and to some extent in Togo, after a momentary expansion in the European cultivation of cocoa, a discouraging phase has become manifest, due to an organisation out of keeping with colonial demands, and also to the damage caused by insects and disease. In 1909 the area under cocoa in Kamerun was 6 060 ha. (15 000 acres) with a total production of 2 418 tons, and a crop per hectare ranging according to locality from 513 to 270 kg. (457 to 241 lbs. per acre).

The Germans in Kamerun have made a strong attempt at colonisation, whose only defect is not having followed the most simple and inexpensive form. In the Gaboon — the basins of Como and Ogone — French initiative has in the last fifteen years created an exceedingly interesting centre of production, and cocoa henceforward is entitled to rank as a product with a future.

The production which, from the economic point of view, presents first rate interest is the native produce, and especially that of the Gold Coast and Lagos. The development of cocoa-growing among the natives of this colony is the greatest example of the development of tree culture among the Negroes. Such examples of the adaptation of modern culture among the natives are only found in Senegal in relation to earth-nuts and among the Benin as regards *Funtumia* and Maize.

In these regions it was the natives who first did everything; the Government came to their assistance later in order to perfect a necessarily primitive work, and put it on an industrial basis.

The total capacity of production of the Gold Coast Colony will not be reached for many years hence and the immense forests of Southern Nigeria every year see a growth in the cocoa plantations. Furthermore, other regions thoroughly well suited for cocoa-growing, such as the Ivory Coast, Gaboon and Liberia, will certainly not be long in taking a share in African production.

As against this increase of African and world-wide production it is desirable to examine the position in point of consumption.

Generally speaking the consumption increases in cold countries, as appears from the following summary (in tons):

	United States	Germany	England	France	Holland	Switzerland	Italy	Spain
1894 . .	7 935	8 320	9 951	14 871	9 656	2 115	650	6 725
1910 . .	50 310	43 940	24 080	25 070	19 190	9 000	1 890	5 520

Commercially it is noted that the market for inferior qualities of cocoa is very firm, and that their future cannot fail to improve when a little more care is used in preparation. These descriptions of cocoa, although not of very high quality, have the advantage of being hardy and highly productive, and therefore deserve the attention of planters.

On the Gold Coast the emancipation of the natives and the fact of their attaining such development as to be able to undertake agriculture profitably are due to the missions which paved the way for the English occupation. The missions created several generations of cultivators, some of them educated and strongly enthusiastic in the work of the soil. Each mission opened in connection with its school an experimental garden and a small plantation. In Lagos on the other hand the same results were not obtained as in the Gold Coast. The population of Lagos is not scattered upon the land, so that the missions created schools in the great centres, following a system of instruction divided into several grades.

Cocoa-growing, which took its rise near to Lagos, passed on to Nigeria and from there to Kamerun, were it finds an excellent environment for its development and an exceedingly numerous population.

On the Gold Coast the production of cocoa is divided into three groups, distinguished by their geographical situation. The first group, the oldest, is that in the East, where the plantations extend to the forest boundaries. The second group is formed of various centres of cultivation which are plotted out along the railway line, and the third, still inconsiderable and consisting of European plantations, is developing in the West of the Colony in the district of Axim.

In Nigeria the cultivation of cocoa, though older, has exhibited less rapid progress than in the Gold Coast Colony. Lagos yields the largest quota of export cocoa in Nigeria ; here the cultivation is likewise encouraged by the existence of agricultural societies, in which the growers meet for discussion and to sell their produce in common. In the province of Eastern Nigeria, made up for the most part of the enormous delta of the Niger, the cultivation is progressing with fair rapidity. Both Lagos and the central and eastern provinces offer a vast field for cocoa-growing.

The commercial methods practised in relation to cocoa in Africa are exactly the same as those used for all African produce.

The prices of African qualities of cocoa were quoted in Hamburg, in December 1911, as follows per 50 kg. (almost 1 cwt.):

Kamerun (Plantation)	58*s* to 59*s* 6*d*
» (Native)	39*s* 8*d* to 49*s* 3*d*
Togo (Plantation)	55*s* 7*d* to 56*s* 4*d*
» (Native)	49*s* 2*d* to 50*s*
Acera (Plantation).	50*s* to 51*s* 7*d*
» (Native)	49*s* 2*d* to 50*s*

Some specimens of Ivory Coast cocoa subjected to examination in the Colonial Gardens in Paris presented the following features:

The unwashed, well fermented cocoa is analogous to Brazilian and San Thomé cocoa if carefully prepared and resembles that of the Gold Coast if less care is bestowed on its preparation. It is suitable for the manufacture of table chocolate. It yields an average of roasted and husked cocoa representing 80 % of the raw cocoa, and industrial cocoa butter is obtained in a quantity equal to 28 % of the roasted and husked cocoa. The selling value of the well-prepared quality is from *73s* to *74s 6d* per 50 kg., including the Colonial duty of 41*s* 5*d*, *i. e.* a price similar to that of the cocoas of the Congo, San Thomé and Bahia.

928 **The Cultivation and Preparation of Ginger.** — *Bulletin of the Imperial Institute*, Vol. X, No. 1, pp. 112-120. London, April 1912.

West Indies. British India. Java. Japan. Sierra Leone

Ginger is the rhizome of the plant *Zingiber officinale*, Rosce, a native of British India, but now grown in different parts of the tropics and especially in the West Indies and Sierra Leone. *Zingiber officinale* is a plant which requires permeable soil; the best varieties of ginger in Jamaica grow in sandy loam, and the best kinds from India are cultivated on sandy soil.

The amount of sand should probably be not more than 30 % and of clay not above 20 %.

Manuring experiments made in Jamaica have shown that marl with 10 % each of potash and ammonia salts and soluble phosphates makes an excellent manure at the rate of one ton per acre. At Cochin (in India) ginger is manured with oil cake and farmyard manure. Two methods of cultivation are adopted; that which gives the best ginger consists in planting pieces of selected rhizomes from the previous year's crop, proceeding as in planting potatoes.

This ginger is called in commerce « plant ginger ». « Ratoon ginger » is obtained by leaving in the soil, from year to year, a portion of the rhizome containing an « eye ».

This develops in the normal way, giving rise to a supply of rhizomes the next season. The ginger thus obtained is smaller and contains more fibre than « plant ginger », and deteriorates from year to year. After being removed from the ground, the rhizomes are very carefully peeled, to avoid destroying the cells immediately below the skin, since these cells contain the oil on which the quality of the ginger depends.

They are then washed, a small proportion of lime-juice being added sometimes to the water, and dried in the sun on a piece of levelled ground covered with cement. The ginger which is not sufficiently white is, in some parts of India, bleached by soaking in limewater for a time.

Sometimes the ginger is not peeled. Much of the Cochin ginger is put on the market unpeeled, but the best grades are peeled and fetch usually higher prices in the United Kingdom.

The yield varies considerably with the climate, soil, and methods of cultivation employed. In Jamaica, the average return is from 1000 to 2000 lbs. of dried ginger per acre. In Bengal the average crop is 1000 to 1500 lbs. per acre, in the Punjab 2100 lbs., in Travancore 2000 to 2500 lbs. In an experimental cultivation at Surat (Bombay Presidency) the yield was equivalent to over 8000 lbs. per acre.

The ginger plant is attacked by few diseases and insect pests, and it has even been recommended that the crop should be planted in orchards to prevent the development of pests of fruit trees.

In Jamaica the ginger plant is attacked by a fungus, which forms spores in a similar manner to *Allantospora radicicola* Wakker, which causes a sugar-cane disease in Java.

In India *Pythium gracile* was found on diseased roots. The disease can be combated by steeping the rhizomes in Bordeaux mixture before planting.

The principal sources of the ginger used in Europe and America are: the West Indies, British India, Java, Japan, and Sierra Leone. In Japan, particularly, attention is being paid to the cultivation and preparation of the better qualities of ginger, such as are now produced mainly in Jamaica and Cochin (India).

The following table shows the exports of ginger from Jamaica, India and Sierra Leone during recent years:

	1906 cwt.	1907 cwt.	1908 cwt.	1909 cwt.	1910 cwt.
Sierra Leone .	11 584	12 369	12 733	14 438	21 860
Jamaica	19 802	18 009	15 890	20 708	20 996
India	88 118	48 353	49 368	64 649	65 544

The ginger from Sierra Leone is of poorer quality than the others; this is due almost entirely to the faulty methods of cultivation and preparation.

The Aromatic Grass Oils.—*Bulletin of the Imperial Institute.* Vol. IX, No. 3, pp. 240-253; No. 4, pp. 333-340. London, 1911. Vol. X, No. 1, pp. 27-34. London, 1912. **924**

British India.
Java.
Uganda.
W. Indies, etc.

The designation « Aromatic grass oils » may be conveniently used to group together the several important volatile oils derived from members of the genera *Cymbopogon*, *Andropogon*, and *Vetiveria* belonging to the order *Gramineae*.

The principal oils are the following:

Citronella Oil (1). Produced principally in Ceylon and Java.

Lemon Grass Oil (1). Distilled chiefly in India, though important quantities are now being made in Java, Uganda, the West Indies, and elsewhere.

Palmarosa Oil (2). Prepared chiefly in India.

Vetiver Oil. Distilled in Rèunion, but probably mostly made from vetiver grass roots imported into Europe from India, Java and elsewhere.

Citronella Grass Oils from Ceylon. Three kinds of grass are known in Ceylon to yield oils of the citronella type, *viz.*: Maha-pengiri, Lena-batu, and Mana. The two first are cultivated, the third is wild. The first is identical with the variety cultivated in Java as the source of citronella oil. The second is the chief source of Ceylon citronella oil. The third comprises at least two sub-varieties.

The importance of the Ceylon citronella industry may be gathered by the following table of exports:

		1905	1906	1907	1908	1909
Quantity	cwt.	11 096	10 837	11 596	12 013	13 849
Value	£	69 417	80 318	92 405	69 577	75 559

There are a considerable number of varieties of *Mana* grass, which may be separated into two groups, viz. *Cymbopogon Nardus* Rendle, var. *Linnei* Stapf (*typicus*), and *C. Nardus* Rendle, var. *confertiflorus* Stapf.

Lena-batu grass oil is derived from a plant identified by Dr. Stapf as *Cymbopogon Nardus* Rendle.

The source of *maha-pengiri* oil is *Cymbopogon Winterianus* Jowitt.

The *mana* grass oils are distinguished by variation in the character of the oil obtained on distillation at different times. This applies to the product of all the grasses from which it is obtained. This difference depends upon the influence of cultivation and manuring. From a commercial point of view none of these oils are of much interest, and they are inferior in quality to the oil made from *lena-batu* and very inferior to that distilled from *maha-pengeri* grass.

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(1) See *Allen's Commercial Organic Analysis*, Vol. IV. DAVIS AND SADTLER: *Resins, India Rubber, Essential Oils.* Ed. Churchill. London, 1911.

(2) From *Andropogon Martini* and *A. schoenantus.* See CAPUS and BOIS, *Produits Coloniaux.* ed. Colin. Paris 1912. See also ALLEN'S, op. cit. (*Ed.*).

The *lena-batu* oils resemble a medium quality Ceylon citronella oil of commerce. *Maha-pengeri* oil is the best.

The results obtained in the examination of these various citronella oils is of great interest and it would be useful to have the experiments continued with a view to the settlement of the following points.

1. The character and quantity of oil yielded by *lena-batu* and *maha-pengiri* grasses in Ceylon at different stages of growth and at different seasons of the year.

2. The effect of various manures on the yield and quality of the soil.

The result of the chemical examination of citronella grass oil from the Gold Coast showed that it was of excellent quality. Its botanical origin is unknown, but its composition indicates that it may be derived from *Cymbopogon Winterianus*.

LEMON GRASS OILS.

These are derived mainly from two kinds of lemon grass, *Cymbopogon flexuosus* and *C. citratus*. The former yields a soluble oil which is of greater value than the insoluble oil distilled from the latter plant. Amongst the varieties of *Cymbopogon* grown in India and Ceylon, Cochin grass is worthy of mention; it grows well and gives a good yield of leaves and furnishes an excellent oil; it will therefore be desirable to encourage its cultivation rather than that of the other varieties.

The lemon grass oils from Uganda belong to the « insoluble » type, as does that of Montserrat.

The Bermuda oil contains less citral than is usually present in lemon grass oil; for this reason it cannot compete with that from India and Ceylon.

The analysis of samples of oil from the Fiji Isles shows that they are not true lemon grass oils, but partake of the characters of both lemon grass and citronella oils. These oils must be derived from a plant not yet exactly identified from the point of view of its commercial value in producing volatile oil. In all these cases, the oil could be used in commerce at a slightly lower price than that of lemon grass oil.

The oil obtained in the Sudan from *Cymbopogan sennaarensis* Chiov. should be accurately determined before it is judged.

VETIVER OIL.

Vetiver oil is derived from the roots of *Vetiveria zizanioides* Stapf (*Andropogon muricatus* Retz [1]) a grass indigenous to India and Ceylon and introduced into Réunion, Java, the Fiji islands and the Seychelles.

In 1909, Réunion exported about 27 cwt. of this oil, which is used for scent-making in Europe. Samples of this oil from Fiji were superior to that from Réunion. The oil from the Seychelles, when distilled by European methods, is equal to the best vetiver oil from India. As regards yield, the percentage of oil obtained from Seychelles vetiver roots is not less than that distilled from those from India.

MARKET GARDENING.

925 POHER, EUG. **The Packing of Fruit and Vegetables.** (L'emballage des fruits et légumes). — *Revue de l'Horticulture Belge et Etrangère.* No. 8, pp. 122-125; No. 9, pp. 142-145. Gand, 15 avril and 1 mai 1912.

France

A good packing must satisfy the following requirements: it must be well conditioned and sufficiently resistant to protect its contents throughout the whole journey; it must allow perishable goods a certain amount of ventilation without incurring the risk of any being pilfered; it must look well so as to give a pleasing aspect to the produce when placed in the market and to conform to the local taste.

The question of price is also important: if sufficiently low it allows the goods to be sold gross for nett, the packing being kept by the buyer, and the expense attendant on returning empties avoided.

Non-returnable packing, though made of light material, must still be sufficiently strong and look well.

There are many kinds of packing used for fruit and vegetables: baskets, sieves, crates, boxes and bags, all made in various shapes and sizes, are the most common.

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(1) See: CAPUS and BOIS, op. cit., and ALLEN'S, op. cit. (*Ed.*).

Square hampers (paniers rectangulaires) are made of wicker work with flat covers. They are made of various sizes to hold 17, 26 and 40 lbs. The 55 lb. hampers are made of various dimensions. These square hampers are used in the season for the transport of common fruit and vegetables.

Cauliflower hampers (paniers à choux-fleurs) have the shape of an inverted truncated pyramid; their covers have a slight bulge. Their usual dimensions are 12×13½×21½ inches. They hold about 66 lbs. of apples or pears, 80 lbs. of potatoes, 44 lbs. of peas or French beans.

Baskets (mannes) have various measurements according to the countries whence they come. The are closed by a piece of packing cloth sown on.

Baskets are also made in shapes in which the length is twice the breadth.

Wide-mouthed baskets (billots) with a lath lattice cover are used for the less fragile produce of the South, such as egg-plant fruits, artichokes, potatoes and grapes.

Sieves are much used on the English markets for the transport of stone fruit.

Open baskets of large meshed wicker work (fleins) are packed in varying numbers in crates. They are especially employed for strawberries. Delicate fruits are packed in *punnets*, a certain number of which fit into strong crates.

Boxes are used for the transport of a number of different fruits and vegetables. They are made of more or less open work according to the amount of ventilation required by their contents. The sizes of these boxes vary considerably. Expensive fruit is sent in small boxes lined with wadding. Medium sized *crates* are very useful, for average quality fruits and vegetables. Those that can be dismounted are perhaps not so good as they soon lose their rigidity and afford their contents less protection.

Bags and *Sacks* can only be used for the least perishable fruit and vegetables.

FRUIT - GROWING.

926 VAN BIERVLIET, P. **French Vineyards compared with those of other Countries.** (Les Vignobles Français). *Revue générale agronomique*, 7me. Année, No. 2, pp. 61-71. Bruxelles, février 1912.

France. Italy. Spain. Portugal

In the world there are 23 regions in which the vine is successfully grown. They are 14 in Europe, 6 in America and 3 in the rest of the world. Only four countries produce wine in sufficient quantities to be able to export it without any compensating importation: they are France, Italy, Spain and Portugal.

The following table shows the average yearly production of wine in the whole world during the last 10 years:

Europe:

	Gallons	
France	1 223 200 000	
(Algeria)	149 600 000	
Italy	877 800 000	
Spain	391 600 000	
Portugal	101 200 000	
Austria	94 600 000	
Russia	57 200 000	
Hungary	57 200 000	
Germany	52 800 000	
Rumania	50 600 000	
Bulgaria	46 200 000	
Turkey	39 600 000	
Greece	30 800 000	
Switzerland	22 000 000	
Servia	13 200 000	
		3 207 600 000

America:

Chile	55 000 000	
Argentina	37 400 000	
Peru	8 800 000	
Brazil	6 600 000	
Uruguay	2 200 000	
		110 000 000

Other regions:

Australia	5 500 000
South Africa	3 300 000
Canaries, Azores, Madeira	3 300 000
	12 100 000
Total of the whole world	3 329 700 000

The following table gives the yearly consumption per inhabitant of the various countries:

	Gallons
France	39.6
Italy	22.00
Spain	18.26
Rumania	5.94
Hungary	4.40
Austria	3.74
Servia	3.30
Germany	1.65
Belgium	1.54
America	0.33
England	0.275

France is thus the country which produces most wine and where the consumption per inhabitant is highest.

Vineyards exist in almost every part of France.

The departments which produce most wine are the following, arranged according to their production :

Hérault, Aude, Gard and Pyrénées Orientales. The wine produced by these departments amounts to $^2/_3$ of the production of the whole country. The average of the last ten years gives :

France	1 223 200 000	gallons
The four southern departments	484 660 000	»
Hérault alone	233 310 000	»

From the point of view of type the wines may be classed as follows:

Gironde	produces	Bordeaux
Côte d'Or	»	Burgundy
Marne	»	Champagne
Saône et Loire	»	Mâcon
Maine et Loire	»	Anjou
Rhône	»	Beaujolais
The two Charentes	»	Cognac.

The departments which produce the greatest quantities of common wines are Hérault, Aude, Gard, Pyrénées Orientales, Var, Vaucluse and Bouches du Rhône.

The average value of the yearly production of wine in France is about £ 40 000 000. The vineyards give employment to about seven millions of people, or about one third of the rural population of France, and one sixth of the whole population.

According to M. J. Du Plessis, professor at the Angers School of Agriculture, there are in France seven principal groups of vineyards which may be classed as follows :

South of France :		Southern	vineyards
		Bordeaux	»
		Charentes	»
East	»	Rhône	»
		Burgundian	»
		Champagne	»
West	»	Anjou	»

The southern vineyards (1 383 200 acres) produce a common and generally dense wine.

The Bordeaux vine lands embrace the departments of Gironde, Garonne and Dordogne. The commonest wines are produced by the low plains called " palus ". The wines known under the name of " Entre deux mers " are also generally of common quality. The best are " Cadillac " and " Loupiac ". The " vins de côtes " made in the St. Emilion district are better.

Among the Bordeaux vineyards those of Médoc are very important. The famous Bordeaux wines are the produce of the Haut Médoc which includes 28 communes among which the chief, both for quantity and quality, are : Cantenac, Margaux, Pauillac, St. Julien and St. Estèphe. All the great brands, divided commercially into five classes, are grown in the Haut Médoc, and among the most esteemed are Château-Lafitte, Château-Margaux and Château-Latour.

The Graves de Bordeaux produce also renowned red wines (Haut Brion, Pape Clément) and the Secondes Graves yields an excellent white wine. The white wines of Sauterne are very fine. In Sauterne the average yield is not more than 80 gallons per acre, but the wine fetches sometimes upwards of 21*s* per gallon. In Sauterne the wine of Château Yquem is famous.

The vineyards of Armagnac and of Béarn are considered as belonging to the Bordeaux group.

The wines of *Charente* are mostly distilled. The best are those produced in the Grande Champagne between Cognac and Barbézieux.

The *Rhône* wines are good common wines. The *Burgundy* vineyards are divided as follows:

Vineyards of Beaujolais and of Mâcon;
» of Burgundy proper or of the Côte d'Or;
» of lower Burgundy;
» of Jura ;
» of Ile de France;

In the first belt, the vines, all of them grafted, are situated at a height not exceeding 1600 feet. The best known red wines are those of Thorins, Chenas and Fleurie; among white wines Pouilly and Solutré.

The great wines of the second belt are produced at altitudes between 750 and 900 feet; the best, such as Pommard, from the highest vineyards, the others from the lower ones.

The vineyards of *Champagne* extend principally in the three "arrondissements" of Reims, Epernay and Châlons-sur-Marne. The area is divided into two regions: The first, called valley of the Marne, is subdivided into three brancshe:

1) Rivière de Marne,
2) Côte d'Epernay,
3) Côte d'Avize.

The two first give very fine and light wines.

The second region, Montagne de Reims, is subdivided into Haute Montagne and Basse Montagne; the wines of the former are better than those of the latter. The land in Champagne is calcareous, and is covered to a slight depth with vegetable soil. By careful improvement the vine growers may be said to have produced an artificial soil. The cost of cultivation attains £ 64 per acre owing to the number of vines, 15 000 to 20 000 per acre. The price per acre is £ 960. The value of the crops is, on average, £ 112 but sometimes it reaches £ 160. In the manufacture of Champagne wines black grapes are also used, which in the Montagne de Reims are paid dearer than the white.

The best brands of Champagne are made with a blend of grapes from at least three regions: Montagne de Reims, valley of the Marne proper, and the region known as " Côte des blancs ".

The red wines of Bouzy are renowned for their fine quality.

In *Anjou* the sparkling wines of Saumur are well known.

927 **The Reconstitution of Vineyards in Hungary.** (La Reconstitution des Vignobles en Hongrie). — *A M. kir. kormány 1910 évi müködéséről és az ország közállapotairól szóló jelentés.* (Extract from the Report of the Hungarian Government on its Work in 1910).

In 1910, the Ministry of Agriculture did much for the protection of vineyards, the improvement of cultural methods and the diffusion of the latter among vine-growers.

In cooperation with Institutions for wine-making and grape-growing it also occupied itself with combating vine diseases.

Hungary

The latter were very destructive. Mildew had severely damaged the vines over an area of 165 786 acres, and to some extent over a further 313 616 acres. Other diseases caused more or less injury to 224 696 acres, and insects to 47 738 acres.

Very energetic measures have been adopted for the control of these diseases and insect pests, especially for mildew; treatment for this was carried out over a total area of 688 416 acres, with fair success over 310 444 acres, and with little result over 377 972 acres.

To repair the havoc caused by hail, especially in the celebrated district of Tokay, the Government made a grant to the proprietors of about £25 000, without interest, to be repaid by five equal annual instalments beginning on April 1st 1913.

Phylloxera was observed during the year upon the vines of 11 communes over an area of 11 400 acres, thus destroying the hope that the stocks of Transylvania which were isolated between mountains and forests would remain immune or at least not be attacked by the disease until much later. In this year 8 267 acres of the vineyards infected by phylloxera but still productive, were utterly destroyed.

According to the last accounts, the total area occupied by vineyards is 753 730 acres.

The following table gives the percentages of the old mountain vines and those of the clayey soils of the plain and of the sandy soils which resisted the phylloxera:

	Acres	%
1) Vineyards in the 1883 survey	885 165	—
Of these:		
Destroyed by phylloxera up to 1910	689 067	77.84
Partly attacked, but still productive	196 098	22.16
Total . . .	885 165	100.00

2) Those destroyed are now made up as follows:

Reconstituted	236 260	34.29
At present used for other crops	452 807	65.71
Total	689 067	100.00

But there are 321 675 acres of new vineyards, planted on land previously under other crops, so that the present area is only 131 132 acres (14.82 %) less than that before the appearance of phylloxera.

3) The reconstituted vineyards newly planted are made up as follows:

	Acres	%
a) Mountain vineyards planted with American stocks	204 439	36.66
b) Mountain vineyards planted with European stocks, treated with carbon disulphide	31 727	5.68
c) Plain vineyards planted with American stocks	42 037	7.54
d) Plain vineyards planted with European stocks treated with carbon disulphide	80 436	14.42
e) Vineyards on sandy soil immune from disease	199 075	35.70
Total	557 714	100.00

4)

	Acres	%
Area of old and new mountain vineyards	321 315	42.63
Area of old and new plain vineyards not exempt from disease	122 472	16.25
Area of old and new vineyards on sandy soil free from disease	309 945	41.12
Total	753 732	100.00

The work of reconstitution was achieved with the valuable help of the State, which, according to the provisions of law V of 1896, made loans to proprietors on very advantageous conditions for the purpose of vineyard reconstitution. This law ceased to be operative at the end of 1910.

The results due to it were very satisfactory, as it made it possible for many proprietors to reconstitute their vineyards according to the methods prescribed by the Government.

The mountain vineyards especially were replanted with American stocks grafted with Hungarian scions.

The State provided most of the stocks at a moderate price. In the autumn of 1910, 13 582 proprietors applied for them.

The production and the sale of plants in the State nurseries in the autumn of 1910 and the spring of 1911 reached the following proportions:

I. Production:

a) American vines	33 844 000
b) European »	3 608 500
c) Grafts	956 000

II. Distribution:

A) at the normal price according to the tariff:

a) American vines	17 043 200
b) European »	420 700
c) Grafts	484 800

B) at reduced prices (average reduction 25 %):

a) American vines	5 157 900
b) European »	68 000
c) Grafts	386 100

III. Used by the State for its own account in its nurseries for the production of canes.

a) American stocks	11 673 400
b) European »	3 119 800
c) Grafts	85 100

The preservation of old vineyards infected by phylloxera has been effected to a considerable degree through the use of carbon disulphide, especially in the Comitats of Baranya, Fejér, Somogy, Tolna, Veszprém and Zala.

In 1910, 60 737 qls. (119 531 cwt.) of this compound was used, of which 32 158 qls. (63 287 cwt.) were supplied by the Zalatna factory and 28 579 qls. (56 244 cwt.) by the Nobel dynamite factory at Pozsony. At the end of 1910 there were 95 carbon disulphide depots, of which three belonged to the State.

RAVAZ L. **Researches on Summer-Pruning of Vines.** (Recherches sur le rognage de la vigne). — *Annales de l'Ecole Nationale d'Agriculture de Montpellier,* Tome XI, Fasc. IV, pp. 285-323. Montpellier, avril 1912. **928**

The experiments of M. Ravaz show the following effects of summer-pruning on vines:

A. Modification of production:

1) Increase, due to increase in *a*) the number; *b*) the volume of the grapes.

2) Decrease, due to decrease in the volume of the grapes.

B. Modification of the quality of the grapes and of the wine.

1) Quality generally impaired by retarding of ripening.

2) Quality also improved.

C. When this practice seems to have no effects, it is because the latter have been too slight, one way or another, to be measured by the methods used for this purpose.

France

D. Modification of the activity or duration of the vegetative period; generally lengthened.

All these effects are well determined and it only remains to study them more closely.

A. *Modification of production:*

1. Increase in the number of grapes. This is only the result of early pruning, *i. e.* pruning done before, during, and shortly after flowering. It then favours the development of the young flowers and bunches, and also prevents the imperfect development or "filage" of the latter, and checks the flowers or young grapes falling off.

This is explained by the fact that the growing tips act like parasites, being maintained chiefly at the expense of substances elaborated or transformed in the other parts of the plant.

Their suppression by pruning renders available for the bunches those substances which the tips would have used to maintain their own growth; thus the grapes, being well supplied with food, grow and develop normally.

Prunings are therefore, all the more efficacious when carried out upon the most vigorous branches and the strongest stocks, that is to say, in rapidly growing vines: Clairette, Grenache, Pineau, etc., or those grafted on a strong stock: Rupestris 1202, etc., because they further increase their productivity.

Amongst the substances rendered available by the suppression of the tips of the shoots, Müller-Thurgau and Cuboni mention sugar especially. Fine weather, which favours the accumulation of sugar in the tissues, also promotes the development of the flowers and grapes, which rarely fall on sunny days.

2. The increase in the volume of the grapes.

Late prunings cannot modify the number of the grapes; but they render available the nutritive substances and notably the sugars, which can be used by the bunches to further their growth and increase the volume of their grapes.

But the increase in number and the increase in volume of the grapes are one and the same thing — the increase in the volume of the fruit. It is now a question of determining whether the efficacy of the pruning remains constant independently of the time at which it is carried out.

If the weight of the bunches of grapes from vines which have been pruned early is compared with that of those which have been pruned late, it appears at once that there is a great difference, and that late prunings are of little use.

No doubt this comes from the fact that the parasitic growing tips continually diminish in absolute importance and still more in relative importance. At first the parasitic surface has a very slight absolute value ; this attains its maximum at the time of flowering, then decreases to nothing soon after the termination of vegetative growth. If there is a fresh growth in August, this value increases again slowly. The non-parasitic surface of the same branches goes on increasing till growth ceases. In taking the ratio of these two surfaces, it is seen that the part played by the tips is of immense importance at the commencement of the vegetative period; it is also of consequence at the moment of flowering, but is negligible soon after the cessation of vegetative growth.

As the aim of pruning is to reduce this ratio, it becomes less valuable as the branches get older, and can even be injurious.

B. *Pruning modifies the quality of the grape and of the wine.*

It impairs or improves it.

a) It impairs it: 1) by retarding ripening; 2) by reducing the total leaf area; 3) by increasing the production; 4) by prolonging the active phase of the vines' life.

b) It improves it. The improvement is only appreciable in the case of bushy vines where the bunches do not get sufficient light. In this case the injurious effect of pruning is largely compensated for by the better lighting of the grapes.

D. *Pruning prolongs the active period of the vine.* — This is effected by the concentration of the vegetative activity in the vicinity of the stock, and by making available to the remaining tissues the water and other substances which would have been utilized by the tips of the shoots.

Conclusions.

1. Pruning reduces the relative importance of the parasitic tips, a useful effect, as is shown by increased production (reducing the falling of the fruit, increase in size of the grapes, etc.).

2. Its importance gradually decreases and is almost negligible from the time of opening of the flower-buds to that of the cessation of vegetative activity.

3. It exposes the bunches to the light, which is useful with regard to quality, though indifferent from the point of view of quantity.

4. It reduces the leaf area, which is harmful as regards both quality and quantity.

5. These effects are simultaneous; their value and results are necessarily variable, and are less apparent when the vines pruned are superior croppers (Aramon, etc.) and the branches are bent.

BERNATSKY, J. **The Reason of the Importance of Tendrils at the Top of Vine-Grafts and Cuttings for Planting.** (Warum soll man auf die Ranke an der Spitze der Setzreben und Veredlungen besonders achten?). — *Allgemeine Wein-Zeitung*, 29 Jahrgang, No. 18, pp. 211-213. Wien, 2. Mai 1912. **929**

Austria

Only some of the nodes of the vine bear tendrils, and as a rule for every two nodes with tendrils there is one without. That bunches of grapes may occur in place of tendrils is well-known to the vine grower.

If the vine is split longitudinally, in such a manner that the bud is on one side and the tendril on the other (when the latter exists), it is found that all nodes possessing a tendril (or a bunch of grapes) have a better developed diaphragm than those without.

This fact is of practical importance, for if in making cuttings or scions the vine or the shoot is cut just above a node without a tendril, *i. e.* above a badly developed diaphragm, it often happens that the vine dies from above in a wedge-shaped manner, on the opposite side to the young shoot.

The writer was able to observe this partial dying of the stem in the case of many cuttings and grafts, which he examined anatomically, and found that it occurred more seldom when well-matured canes with well-developed diaphragms were used.

Care should therefore be taken, especially in districts where the vine wood often ripens with difficulty, both in the making of cuttings, and also in the preparation of grafts, that the cut should only be made above a node which bears a tendril.

FORESTRY.

980 MINISTERIO DE FOMENTO (GALLEGO T. *Director general de Agricultura, Minas y Montes*). **The Working Programme of the Spanish Forestry Department.** (Servicio forestal. Tercera parte. Lo que debería ser nuestro servicio forestal). — *Memoria relativa á los servicios de la Dirección general de Agricultura, Minas y Montes*, T. II, pp. 267-456 (381-403)+grr.+cc. Madrid, 1912.

Spain

The State, or more accurately speaking the public, forests (montes de utilidad pública) comprise in addition to the State forests those of the other public bodies, and especially the communal forests, which form the most considerable nucleus. On the 1st January 1912 the area of public forests was 12 428 736 acres, with a wooded area of 11 865 457 acres, divided into 8152 domains. (1).

In the forestry year 1910-11 the area under management was 910 568 acres and that worked 709 287 acres; there are also working-plans for a further 160 022 acres. The results may be summed up as follows:

Annual revenue before management . . .	£33 066
Annual revenue after management. . . .	£100 597
Revenue per acre before management . .	10 ½d
Revenue per acre after management. . .	2s 3 ½d

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(1) According to extant data the general conditions of forestry in Spain are as follows:

Forest area acres —	Percentage of wooded area	Wooded area per inhabitant: acre	Percentage of State Forests
20 973 000 (16 000 000)	16.9 (13)	1.24	84.0

(ENDRES: *Handbuch der Forstpolitik*, 1905). (*Ed.*).

From the sylvicultural point of view it is of interest to know the distribution of the species in the managed forests:

Predominating species	Area		Capability	
—	unplanted	total	total	annual
	acres		cub. ft.	
Abies pectinata D. C.	15 560	37 407	33 584 000	433 280
Pinus Pinaster Sol..	53 765	300 026	6 419 121 000	1 030 000
Pinus sylvestris L.	40 169	209 527	149 406 750	2 261 150
Pinus Pinea L.	77 494	161 826	18 242 750	507 750
Pinus Laricio Poir.	37 965	192 778	110 896 750	1 687 000
Pinus halepensis Mill.	178	5 261	1 040 180	23 840
Quercus Tozza Bosc.	30	29 833	4 818 200	53 220
Quercus pedunculata Ph.	1 383	44 755	20 934 200	355 000
Quercus Suber L.	39 028	120 342	30 605 000 000	1 148 500
Fagus sylvatica L.	17 811	64 109	64 401 000	766 900

It should be noted that there are 3 056 455 trees of *Pinus Pinaster* producing resin; the yield capacity of cork is 75 tons from *Quercus Tozza* and 33 793 tons from *Q. Suber.*

Let us now see how the forestry problem presents itself in Spain, and upon what lines the Spanish Forestry Department proposes to deal with it.

The problem would include the reafforestation of all the waste lands in the Spanish territory, but the Administration will prudently confine itself to direct action in public forests, and as regards other forests will assist private initiative by supplying plants, granting premiums and carrying on energetic forestry propaganda.

With the problem thus restricted, the extent of the work will nevertheless, remain considerable. In point of fact the area of public forest is composed as follows:

	acres
High forest	5 090 083
Bushwood	3 408 889
Bushwood and pasturage	3 929 764
Total	12 428 736

In view of the irregular composition of these areas the work must be distributed as follows:

	acres
High forest to be managed	2 545 041 ½
» » to be reafforested	2 545 041 ½
Bushwood to be managed	1 704 444 ½
» to be reafforested	1 704 444 ½

With regard to the reafforestation, it must be effected as follows:

	acres
High forest to be naturally regenerated	1 272 520 3/4
High forest to be artificially regenerated	1 272 520 3/4
Bushwood to be planted.	1 704 444 ½
Bushwood with pasturage to be planted	3 929 764
Total . . .	8 179 250

There must also be considered 740 000 acres which require regulation of streams, one half consisting of public forests and one half to be purchased.

This makes an aggregate of 6 511 363 acres to be artificially reafforested; 740 000 acres requiring regulation of streams and reafforestation.

It must also be taken into account in relation to the foregoing that nearly 1 000 000 acres of high forest can already be regarded as under management, so that there remain to be brought under management:

1 555 510 acres of high forest;
1 704 444 » of bushwood.

It is necessary however that this work should be accompanied by the definite delimitation of public forests, of which at present 2 106 010 acres can be regarded as delimitated, the total to be delimitated being 7 400 000 acres.

On the basis of the work hitherto carried out, the unit costs per acre may be computed as follows:

	£ s d
Reafforestation	1-12-0
Acquisition, fixation and reafforestation of lands to be incorporated	6-8-0
Management of high forests.	3-3
» » coppice	1-7
Delimitation	1-1

Applying these unit costs to the computed areas we have:

	£
Reafforesting 6 511 363 ac.	10 456 484
Acquisition of lands (370 000 ac.), fixing of torrents and reafforesting 740 000 ac.	4 761 840
Management of 1 555 510 ac. of high forest	249 976
Management of 1 704 444 ac. of bushwood	136 857
Delimitation of 7 400 000 ac.	714 276
Total . . .	16 319 433

With this sum 12 799 400 acres will be put into full forest production, nearly 10 million being high forest. On the basis of an annual yield of 9*s* 6*d* for high forest and 6*s* 6*d* for the others, which represents a cautious estimate, the annual revenue of the public forests when completely restored would be £5 716 400, which at 4 % represents a capital of £142 910 000.

In addition to this considerable direct economic benefit, all the indirect advantages must also be borne in mind: increase of value of the valley lands and regulated streams, reclamation of low regions and protection against damage by floods.

The Budget of the Prussian Forest Administration for 1912. (Mitteilungen. — Der Etat der preussischen Forst- Domänen- und landwirtschaftlichen Verwaltung fur das Etatsjahr 1912). — *Forstwissenschaftliches Centralblatt,* LVI. J., H. 4., pp. 217-224. Berlin, April 1912. **981**

Germany
Prussia

In point of technical and administrative development and of the amounts involved, the Budgets of the Prussian Forest Administration have grown to be of general importance as typical of a forest administration which is at once highly complex and advanced.

We give in the first place the fundamental technical particulars according to the Budget for 1912.

Area of State Forests:

(*a*) Forest lands adapted for forest production 6 669 885 ac.	7 466 650 ac. (28 840 ac. more than in 1911)
(*b*) lands not adapted for forest production 796 765 ac.	

Natural produce **calculated on a basis of yield capacity**:

(*a*) forests with working-plans 29 423 700 cu. ft.	36 707 500 cu. ft.
(*b*) forests without working plans 7283800 cu. ft.	

The *Aggregate Revenues for Timber* are:

(*a*) Financial year 1909 (1)	£5 843 347,9s
(*b*) » » 1910	£5 790 913,11s

which means an annual average of £5 817 130,10s. In 1911 there was a rise in the price of timber and a rise is likewise to be anticipated in 1912; allowing moreover for an extraordinary felling of reserve in consequence of a fire, the *estimated revenues* for 1912 are £6 323 500.

In secondary sources of revenue increases are likewise provided for, as also in shooting, owing to the increase of the charge for big game and the incorporation in the revenues of the rights on small game shooting. Consequently the Budget is summed up as follows:

Revenues:

1. Timber, forest year 1st Oct. 1911-12	£6 323 500
2. Secondary revenues	» 321 750
3., 4., 5., 6., 7. Shooting, peat administration, schools and sundry	» 134 000
8. Sales of land	» 341 000
Total . . .	£7 120 250

Expenses:

1. Administration and management	£2 689 175
2. Forestry instruction and science	» 20 000
3. General	» 339 175
4. Extraordinary	» 473 875
Total . . .	£3 522 200

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(1) These figures are calculated at 20.40 Marks to the £1. (*Ed.*).

There is therefore a surplus of £3 598 100 which represents a reduction of £150 000 on 1911.

Finally, among the general expenses there should be noted: £51 500 for the purchase of lands; to which are added among the extraordinary expenses £301 300 for purchase and organization of lands and for the preparation of lands for sale; the same extraordinary expenses further include £137 650 estimated for the redemption of servitudes, rents and other liablities.

TIEMANN. **Deep Planting for Dry Soils.** (Tiefpflanzung [« Senkpflanzung »] für trockeneren Boden). — *Allgemeine Forst- und Jagd-Zeitung*, LXXXVIII. J., pp. 90-94. Frankfurt a. M., März 1912. **982**

The prolonged drought of last year not only proved injurious to agriculture, but inevitably caused heavy losses in forest plantations.

To guard against untoward results of this kind the Author advises deeper planting, especially in light dry soils. In this way the formation of tap roots may be brought about, ensuring the success of pine plantations on sandy soils, oak on dry sandy loams and beech on calcareuos as well as sandy soils. **Germany**

With regard to the depth to be adopted, it might, for very young plants, be such that they scarcely emerge from the soil, for larger ones to about half way up the stem; but it may be determined in each case by preliminary experiments.

For planting, a good method is to put ball-plants in deep holes cut out with a mattock; this is specially useful for ground full of stones or roots.

The advantages of deep planting appear to be:

1. It allows the roots to go deeper and find more moisture.
2. This moisture deeper in the soil does not evaporate so readily as that nearer the surface.
3. The nutritive mineral substances of the soil and the manures used are soluble in a greater degree and therefore more utilised by the plants.
4. Rain water is accumulated, the hole thus forming a reservoir of moisture.
5. Insolation acts less intensely, reducing the probability of drying of the roots, in addition to which, early development being prevented, the damage caused by late frosts is obviated.
6. The freezing of the young plants is avoided.
7. The growth of grasses and weeds is reduced.

8. The relative depth at which the young tree is placed encourages development in height in the first stages.

9. It would seem to be a method for controlling the damage caused by white grubs.

The method is more expensive than the usual one, but in the case of dry soils the advantage of securing a stand of trees would more than counterbalance this.

It must furthermore be noted that with this method the planting even of exacting species can be undertaken in dry soils, in mixed plantation if necessary. The application of manures and indirect fertilizers - such as peat in sandy soils - is also facilitated.

Similarly, deep sowing in dry soils may be recommended.

In conclusion, the method merits confirmation by comparative experiments.

983 **Switzerland**

Effect of Carbon Disulphide on the Growth of some Forest Trees. — See below, No. 985.

LIVE-STOCK AND BREEDING

HYGIENE.

984 **Measures taken against Texas Fever by the United States Department of Agriculture.** (Rule 1, Revision 9. To Prevent the Spread of Splenetic, Southern or Texas Fever in Cattle). *U. S. Dept. of Agriculture, Bureau of Animal Industry, Order 187.* Washington, 1912.

United States

The United States Department of Agriculture published, in March 1912, a new Order for the control of Texas fever (known also as splenetic or southern fever) in cattle.

It contains a list of the States, or parts of the States, which are in quarantine.

No cattle from these areas are allowed to be moved to any not quarantined portion of the United States, without special precautions, unless they are to be immediately slaughtered.

Some of the States which are in quarantine are permitted to move cattle for other purposes, if the said cattle have been continuously kept on premises known to have been free of infection for at least six months, if they have been inspected and found free of infection and a certificate authorizing the shipment issued by an inspector of the Bureau of Animal Industry, and if permission is obtained in advance of the movement from the proper official of the State into which the cattle are to be shipped. It is however forbidden to move cattle from an area which may only send cattle destined for immediate slaughter, to another infected district whence, subject to the above mentioned precautions, cattle for other purposes may be despatched.

During December and January, and in some States, also in November, February and March, cattle may be moved interstate from countries or localities, where co-operative tick eradiction is systematically conducted, provided they have been continuously kept on premises known to be free of infection and if they have been pronounced healthy by an inspector of the Bureau of Animal Industry and if permission is first obtained from the proper official of the State for which the cattle are destined.

If cattle from the quarantined areas are twice dipped in arsenical solution, within an interval of 5 to 10 days, under the supervision of an inspector of the Bureau of Animal Industry, they can be moved to other States with the permission of the said States.

Cattle from districts where the co-operative tick eradication is practised only required to be dipped once.

For each 500 gallons of standard arsenical solution are used 10 lbs. of finely powdered white arsenic containing not less than 99 % of arsenic trioxide, 25 lbs. of sal soda and one gallon of pine tar. The arsenic and sal soda should be boiled together in not less than 25 gallons of water for 15 minutes, or longer if necessary to effect the complete solution of the arsenic. Before the pine tar is added the temperature of the solution must be reduced to 140° F. The pine tar should be added gradually, after which the solution should be thoroughly stirred and enough water added to make 500 gallons of dip.

The transport of all these animals is to be effected in disinfected cars or boats. Unloading on the journey is only permitted at specially designated points.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

985 **Regulations for Animals on the German Railways.** (Deutscher Eisenbahn-Tier-Tarif, Teil I. Aenderung der Anlage B zur Eisenbahn-Verkehrsordnung). — *Zentralblatt der Preussischen Landwirtschaftskammern.* 11. Jahrgang, No. 16, p. 111. Berlin, 15. April 1912.

Germany

The German Federal Council (Bundesrat) has made a regulation, that all animals to be convoyed by rail must be fed and watered by the sender before they are placed in the trucks. Should the journey last more than 36 hours (therefore at latest after each 36 hours), the animals must again be supplied with food and water.

Small animals, and those in cages, which are sent by rail, must have sufficient space to lie down.

The direction of the railways has made a regulation, that from May 1, 1912, all animals which require food and water during the journey must be accompanied by a man (one for every three trucks) deputed by the sender to attend to their wants; but the sender may instruct a responsible person to undertake this duty at the stations in question. This regulation applies also to single large animals, but small animals in cages travelling alone will be provided by the railway officials with food and water.

This regulation does not apply to army horses.

986 von Braun. **Co-operative Pig-fattening Establishment for Ulm and Neu-Ulm.** (Die genossenschaftliche Schweinemästerei für die Städte Ulm und Neu-Ulm). — *Landwirtschaftliches Jahrbuch für Bayern*, 2. Jahrgang, No. 3, pp. 122-167. München, 1912.

rmany:
avaria

About two years ago, a Pig-breeding Cooperative Association was founded at Weissenfels near Ulm, which in 1911 reared over 1000 young pigs, and supplied them to the farmers of the neighbourhood. In consequence of the high price of meat in 1911, Professor Falke in Leipzig, in cooperation with this Society, devised a plan by which the latter could increase its annual production by 2000 to 3000 head; the young pigs were fed in special fattening-establishments on crushed barley, meat meal and fish meal till they reached the live-weight of 240 lbs. and then sold at a fixed price to the towns of Ulm and Neu-Ulm.

The views of Prof. Falke are given *in extenso* in the above mentioned work; they are based upon the pig-fattening experiments of Prof. Lehmann in Göttingen; the latter found that for the production of 100 lbs. live weight, 350 lbs. crushed barley and 30 lbs. of meat meal and fish meal are required, if the pigs are only fattened to the live-weight of 240 lbs. A pig of this weight will be completely fattened in 22 weeks, and the cost of food used will be from 61.23 M. (£3) to 68.82 M. (£3. *7s 6d*), according to prices.

To this must be added the initial cost of buying the young pigs, which can be reckoned at 23.50 M. (23*s*) per head, and also the interest on the capital expended (on sties, machines, utensils, food stuffs and pigs), wages of the pigman, insurance premiums and an additional 5-10 % on the feeding costs to cover risks. When the selling price is 1 M. per kg. (5 ½*d* per lb.) of live weight, the cost of food stuffs must be moderate in order to leave a margin for profit.

In order to avoid too high risks for the Society, the undertaking could therefore only be begun with the assistance of the town Authorities.

To this end, a contract was drawn up, in Dec. 1911, between the Weissenfels Society and the Corporations of the towns of Ulm and Neu-Ulm. This contract holds good from Jan. 1st 1912 to December 31st 1916.

The above mentioned towns give to the Society the ground for the erection of 3 to 5 fattening establishments and one food-depot. They further undertake to pay 4 % on the construction costs up to 15 000 M. (£750), and give 60 M. (£3) credit, without interest, for every pig, to cover cost of feeding.

The towns promise to take the pigs from the Society at the constant price of 100 M. (£5) per 100 kg. (220 lbs.) of live-weight or 126 M. (£6,4*s*) per 100 kg. of carcase weight.

The Society undertakes the construction of the necessary buildings, carries on the whole business, takes all risks and is liable as regards all its assets to the two towns for the credit received. The pigs are insured at 60 M. (£3) per head by a Stock Insurance Company.

As the contract expires at the end of five years, and no guarantee has been given of its extension, the Society would have been obliged to redeem their buildings in five years, which would have been too heavy a tax on the outlay, and rendered all profit impossible. The Bavarian Ministry of State has guaranteed them 25 000 M. (£1250) at 3 %, on credit, to be repaid in 20 equal yearly instalments; should the contract between the Society and the towns of Ulm and Neu-Ulm not be renewed at the end of five years, the ministry of State remits to the Society the repayment of half the sum still owing.

The Society has, in the meantime, begun building the fattening establishment; the buildings will be constructed in a simple manner. According to the plans and designs given in the abovementioned work, the total cost of four piggeries, each for 200 to 250 pigs, and of a food depot with electric motor and mill, and also of the laying out of the fields and road-making, will amount to 33 500 M. (£1675).

987

The Organization of Cattle Breeding in Kamerun. (Über die Organisation des Viehzuchtwesens in Kamerun). — *Deutsches Kolonialblatt*, XXXIII. Jahrgang, No. 6, pp. 253-260. Berlin, 15. März 1912.

Kamerun

The German Government established, in 1898, a cattle-breeding farm at Buëa on the Kamerun mountain, and stocked it with 8 heifers and 2 bulls of the Allgäu breed; in 1909, ten more Allgäu cows were added and later, new bulls on two occasions. The herd has now increased to 92 head, including 46 cows and 3 bulls, in spite of the damp mountain climate (the annual rainfall exceeds 3000 mm., *i.e.* 118 in.) and is now flourishing. As far as present experiments show, the Allgäu breed is less suited for lower lying parts of Kamerun.

According to the original plan, the stock-breeding farm at Buëa was intended to supply bulls to the natives, and thus improve the small race of cattle indigenous in the forests round Buëa. As, however, the natives of this district pay little attention to cattle breeding, all exertions in this direction have hitherto been without success. Bulls were therefore supplied to the Government cattle-breeding stations. On a branch farm belonging to the Buëa cattle-breeding farm, crosses were made between Allgäu and Zebu cattle, and between Allgäu and Kamerun cattle, in order, on the one hand, to obtain experience in breeding and, on the other, to produce draught oxen and animals for the butcher. There are at present 175 head.

There are two more cattle-rearing farms in the Bambuto Mountains, Dschang and Djuttitsa, where pure Zebus are bred and crosses are tried between the Allgäu and Zebu breeds and the Zebu and Kamerun.

The first Zebus were obtained from Adamaua and Banjo, and show a marked superiority over the native cattle.

The Zebu herds of both stations now consist of 419 head, and when they have increased to 1000, will provide the natives with about 100 draught animals a year. The young natives receive instruction in cattle-breeding from the agricultural school connected with the Dschang Breeding Station.

HORSES.

WATERS, H. J. **Tests of Grain and Hay for Work Horses.** — *The Breeders' Gazette*, Vol. LXI, No. 13, pp. 763-764. Chicago, March 27, 1912. **988**

United States: Kansas

A feeding experiment undertaken for the purpose of finding a good and cheap substitute for oats as a horse feed was carried out last year from the middle of January till the end of May on 905 artillery horses weighing 1 150 to 1 175 lbs., at the Ft. Ridley Military Reservation (Kansas).

The horses were, on an average 10 years old; they were divided into 17 lots, of which 10 contained 73 to 79 head each, and 7 contained 17 to 20. During the 110 to 140 days the experiment lasted, the horses drew light loads, but were made to work quickly.

In bad weather, they were exercised over a six miles course and at a trot and a gallop.

The grain was given three times a day and the hay once, at night; the horses were watered in the morning about two hours after being fed. After returning from their artillery drill, they were turned into an exercise lot, where they had access to water and remained till night.

Except for their food, all the horses were treated alike.

The different rations and the results obtained with them were as follows:

Ration: 12 lbs. oats, 14 lbs. prairie hay. Result: the horses were in good condition, had good endurance and spirit throughout the trial; average gain 16.3 lbs. per horse. The cost of feed per day per horse was 20.3 cents and was computed on the basis of a 1000 lbs. horse.

Ration: 12 lbs. corn (maize), 14 lbs. prairie hay. Result: Spirit and endurance good ; but when the weather became warmer. the loss of weight was, on the average, 29 lbs. per horse. Daily cost of feed 17.7 cents.

Ration: 4 lbs. corn (maize), 8 lbs. oats and 14 lbs. prairie hay. Result: better than with corn alone; but not so good as with oats only. Average loss of weight 13.3 lbs.

Ration: 8 lbs. corn, 4 lbs. oats and 14 lbs. prairie hay. Result: condition and spirit not as good as with the larger amount of oats. Loss in weight 13.3 lbs.

Ration: 4 lbs. oats, 4 lbs. wheat bran, 6 lbs. maize, 12 lbs. timothy hay. Result: this was the most satisfactory of all the rations, but it cost 19 cents per day, which is rather high. Gain per horse 6 lbs.

Ration: 4 lbs. oats, 4 lbs. wheat bran, 6 lbs. corn, 12 lbs. prairie hay. Result: scarcely as good as with timothy hay, but better than with the other rations. Average loss of live weight 6 lbs. per horse.

Ration: 4 lbs. oats, 6 lbs. corn, 1 lb. oilmeal, 12 lbs. prairie hay. Result: the horses were in very good condition, loss of weight 2.5 lbs. per head. Cost of ration 17 cents.

Ration: 3 lbs. bran, 6 lbs. corn, 1 lb. oilmeal, 14 lbs. prairie hay. Result: the horses kept in good condition and looked well. Average gain 4 lbs. each; cost of ration 16.7 cents per day.

Ration: 8 lbs. corn, 2 lbs. oats, 10 lbs. lucerne hay. Result: the horses did well, they made an average gain of 25.6 lbs. per horse and the ration cost 13 cents daily.

Ration: 12 lbs. barley, 14 lbs. prairie hay. Result: the horses worked well; average gain in live weight 8 lbs. per head.

Ration: 8 lbs. oats, 4 lbs. corn, 14 lbs. timothy hay. Result: the timothy hay seemed better than prairie hay with an equal grain ration. Loss of weight 7.7 lbs., cost of ration 19.3 cents per day.

Ration: 4 lbs. oats, 6 lbs. corn, 4 lbs. lucerne meal, 12 lbs. prairie hay. Result: the horses lost 8.3 lbs. per head.

Another lot of horses, which had the same rations per day and head except that the 12 lbs. of prairie hay were replaced by 12 lbs. of timothy hay, showed itself superior in condition and thrift and further there was an increase of 3 lbs. per head.

Ration: 4 lbs. oats, 6 lbs. corn, 4 lbs. bran, 12 lbs. prairie hay. Result: 6.7 lbs. loss per horse. Substituting timothy hay for the prairie hay, there was a gain of 6 lbs. per horse.

In all the tests, timothy proved slightly superior to prairie hay as a horse feed.

Curtis, R. S. **Cottonseed Meal Feeding Experiments with Mules and Horses.** — *North Carolina Agricultural Experiment Station, Thirty-fourth Annual Report*, pp. 151-185. Raleigh, 1912. **989**

In order to ascertain the value of cottonseed meal as a feed for horses and mules, the author carried out, from 1908 to 1911, some feeding experiments on six mules at the North Carolina Agricultural Experiment Station, besides which he collected the experience of farmers who fed cottonseed meal to their work stock.

United States

The feeding experiments were divided into four periods; in the first, the preliminary period, five mules were fed shelled corn and cottonseed meal, and only one was given shelled corn alone, as concentrated food. The roughage consisted, throughout the experiment, of corn stover and sometimes, exceptionally, of different kinds of hay.

In the three principal periods the ration of concentrateds fed to three of the mules was either shelled corn, ear corn or corn and cob meal. The other three mules had the same concentrateds, but in smaller quantity, the difference being made up with wheat bran and cottonseed meal. All the animals under experiment worked.

The experiments showed that no inconvenience arose from the use of cottonseed meal in moderate quantities (about 10 % by weight of the whole ration, or 1 ½ to 2 lb. per head per diem) and intimately mixed with bran or maize meal. When greater quantities of cottonseed meal was fed, the animals lost weight and their capacity for work was impaired. Besides, after a short time, they refused eating it when given too liberally.

The experience of farmers who fed their horses and mules with cottonseed meal was, in the main, to the same effect. Some farmers stated that when the meal is fed in excess it causes weakness of the eyes and even blindness, but the author considers that if the meal is fed with judgment no trouble should arise.

CATTLE.

940 MURRAY, JAMES. **Fed Outside versus Inside.** — *Experimental Farms: Reports for the Years ending March* 31, 1910 *and March* 31, 1911, pp. 381-384. Ottawa, 1911.

Canada.

At the Experimental Farm for Manitoba at Brandon, steer feeding experiments were made in the winter 1909-1910, as well as in the two previous winters from December 1st to May 5th.

The animals were divided into two lots.

Lot I consisted of 20 oxen, which were fed outside; natural shelter was afforded to them by poplar and oak scrub and gullies.

Their food consisted of hay, straw, grain, linseed meal and bran. The grain ration was, to begin with, 4 lbs. per day, one half bran and one half barley and oat chop; this ration was increased every week, till at the end of January about 15 lbs. per day were given to each animal.

From that date, the grain ration rose about 2 lbs. Practically, the oxen were given as much of it as they would take. At first, hay was added to the grain; when the latter ration reached its maximum, straw was given in place of hay. In the experiments of the previous year, the animals used to drink the water of a small stream; but as this often froze, so that the animals were without water, this year they used a water-trough, which was provided with a heating apparatus.

Lot II consisted of 16 oxen, which remained in the shed the whole time and were well attended to. They were given hay, ensilage, straw, roots, cereals, bran and linseed meal.

The following tables give a list of the food stuffs used and the results of the experiments:

TABLE I.

Food stuff	Price per ton.	Amount of Food Used	
		Lot I	Lot II
	$	lbs.	lbs.
Hay	4	58 000	7312
Straw	1	28 000	14 315
Ensilage	2	—	84 880
Roots	2	—	9 216
Cereals	20	43 906	15 994
Bran	18	920	736
Linseed-meal . .	30	930	744

TABLE II.

		Lot I	Lot II
No. of steers		20	16
Average weight at commencement	Per steer.	1048 lbs.	1047 lbs.
» » » end of experiment		1207 »	1289 »
Daily increase		1 lb.	1.56 lb.
Total cost of food		29.57 $	18.25 $
Gain or loss (1)		−1.84 $	+13.77 $

(1) Labour is not reckoned in.

As long as the animals outside were given hay (until the end of January), they increased in weight, but when the hay was replaced by straw, they lived almost entirely on grain and only eat a very little straw; many lost weight as soon as they were supplied with straw.

It is seen that the financially unsatisfactory result of the outside feeding was due to the mistake in the rations. Hay cannot be replaced by straw, even with the addition of a large amount of grain; if it is necessary to use straw as a feed for a time, it is advisable first to give the straw and subsequently hay.

COUSINS, H. H. **Jerseys at the Hope Stock Farm. Crossing with Zebus.** (Stock Farm at Hope). — *Bulletin of the Department of Agriculture, Jamaica*, Vol. 2, No. 5, pp. 42-49. Kingston, 1912. **941**

The Jersey cow in Jamaica has, according to present experience, handed down its excellent milking qualities to its offspring.

Many of the best milch cows on the Hope experimental farm are Jersey crosses.

Neverthelers, Jersey crosses are inferior to the pure-bred native oxen from the points of view of beef and of ploughing. **Jamaica**

Hope Farm obtained from the United States in 1911 a Jersey cow in calf and twelve heifers some of them also in calf. The cow died on ship-board as the result of abortion, and one of the heifers perished from red-water (1); the eleven others were saved on the outbreak of this disease by injections of Trypan blue and became very well acclimatized.

Five other Jersey animals — one bull, three heifers and a cow — were brought over from the Channel Isles. The cow was far advanced in the gestation period, calved soon after arrival, and died of puerperal fever. The loss of this cow and of the one above-mentioned must be attributed to the effect of the sea voyage upon them when too for advanced in the gestation period.

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(1) See *B.* May 1912, No. 810. (*Ed.*).

The bull and two heifers got well through the red-water disease by means of injections of Trypan blue, but the third heifer succumbed to the malady as the injections used were too weak.

Of two lots of cows (Jersey and Guernsey crosses, high grades) from Canada, the first suffered much from bad weather during transport; those of the second batch were also too near calving time; so out of twelve cows, only five were left.

The Hope Experiment Farm has imported into Jamaica 49 head of cattle at 11 different times, and the following are the results of their efforts:

Loss at sea, covered by insurance	2	head
Loss after landing, not covered by insurance	2	»
Loss through red-water	2	»
Loss through abortion combined with red-water	6	»
Acclimatized	37	»
	49	head.

According to the experience of the Jamaica cattle-breeders, the admixture of Indian blood in all breeds is necessary in order to obtain paying animals which are capable of adaptation to the conditions of life obtaining in that island. The Hope Experimental Farm has thus begun to create a breed of milch cows suitable to Jamaica by crossing Zebus and Jerseys. It is not an easy matter, as some breeds of Zebus give little milk. Other breeds are very wild and will not allow themselves to be milked. The Nellore race yields the most milk and is also the tamest.

SHEEP.

942 FÜHRER, DR. LUDWIG. **Studies on the "Steinschaf".** (Studien zur Monographie des Steinschafs). — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k.k. Hochschule für Bodenkultur in Wien,* Band I, Heft 1, pp. 91-114. Wien, 1912.

Austria The "Steinschaf" lives in the Tauer district in the Austrian High Alps. It is stall-fed in winter, but only given scanty rations;

in the warmer part of the year, it grazes on the alpine grasslands at the extreme vegetation limit, which are too steep for cows. Herein lies the economic value of this breed of sheep.

The Steinschaf is medium sized, has a slightly arched head, pointed nose, short neck, deep but narrow chest, sloping shoulders, fairly wide hips, and sloping rump; in most of the animals, the highest point of the latter is higher than the shoulders. The legs are long and slender and the hoofs very sharp. Most individuals are horned. The body, with the exception of the face, belly and feet, is covered with wool which, according to the writer's measurements, has a staple-length of 93 to 145 mm. (3.6 to 5.6 in.).

The ewes are not full-grown till they are 3 ½ years old and their average weight is then 30 to 35 kg. (66 to 77 lbs).

The origin of this breed is unknown.

Both sexes are used for breeding purposes when from 7 to 10 months old. While the ewes are fertile till they are seven years old, the rams are seldom kept beyond a year and a half; they are castrated when a year old, before they graze a second season on the alps, and they are slaughtered in the autumn, at the close of the grazing period.

The Steinschaf is shorn twice a year and yields 1.6 to 2 kg. (3.5 to 4.4 lbs.) of wool annually, which is very full of yolk, and the loss in washing is 35-45 %. It may be black, grey or white; some of it is used by the farmers for knitting, though the greater part is sent to the cloth factories.

The flesh of the Steinschaf is fine-grained and contains few fibres and little fat; its flavour is excellent. The ewes are not used for milk production.

The small amount of care which is generally given to this sheep, the early breeding practised, and the very frequent mating of nearly related animals, are gradually bringing about the degeneration of the breed. Lately the race has been crossed with Hampshires. The cross-breds mature earlier and are heavier than the Steinschaf, but for this reason are not so active on mountain slopes; also their flesh is coarser, contains more connective tissue, and is less fine in flavour than that of the pure-bred Steinschaf.

POULTRY.

948 MAURER, OTTO. **Bacteriological Studies on Eggs**· — *Kansas State Agricultural College, Experiment Station, Bulletin,* 180. Manhattan, Kansas, 1911.

United States

I. The preservation of eggs by desiccation and freezing has reached considerable importance in the United States.

The daily capacity of the firms producing desiccated eggs in Kansas alone is about 360 000.

The methods for judging egg-preparations depend largely on the quantity of bacteria present. It has been shown that normal eggs may contain bacteria, and also that the oviduct is by no means always sterile (Zimmermann, Abel, Poppe, etc.).

Some investigators maintain that colon bacilli never occur in any quantity in fresh eggs; the experts of the manufacturing interests, however, contest this view.

The writer therefore examined a great number of eggs with regard to the presence of *B. coli* in them as well as on the shells.

a) Sixty eggs from thirty different hens from the College were examined. *B. coli* was not found in any of these eggs. It was however found on the shells of 27 % of them.

b) Two eggs were obtained from each of twenty-five different farms in the vicinity of Manhattan; *B. coli* was absent from the contents of these eggs, but was found on the shells of 18 % of them.

c) Twenty-five eggs at least three weeks old and soiled with faecal matter were obtained from a packing-house. *B. coli* was not found in any of these eggs, but was found on the shells of all of them.

d) The same result was found on examining fifteen eggs which were covered with faeces and portions of broken eggs.

e) Twenty-four eggs were then taken. Eight of them were cracked before they were soiled; eight were used in their original state, and eight were washed and scrubbed with a brush to remove the membrane covering the outside of the shell. All these eggs had been soiled with faeces and with egg meat heavily infected with *B. coli*. These eggs were kept at room temperature and one of each series was examined every other day. *B. coli* was never found in these eggs, though it was always found on the shell.

It has been shown by several investigators, that the egg exerts a marked bactericidal action on some organisms, *e. g. B. anthracis*, *B. subtilis*, *Proteus Zenkeri*; possibly therefore *B. coli* had been thus destroyed and this accounts for its absence.

To determine whether the egg contents exert a bactericidal action on *B. coli*, the following experiments were made.

To 5 cc. of albumen taken under aseptic conditions from a fresh egg were added three drops of a 1 : 1000 dilution of 24 hour bouillon culture of *B. coli gallinarum*. Later, the infected albumen was dissolved in physiological salt solution and Agar-agar plates inoculated with the mixture. On all the plates large numbers of *B. coli* were found. These results confirm the observations of Laschtschenko that concentrated egg-albumen does not exert any bactericidal action on *B. coli*. It seems that the only explanation to be given of the absence of *B. coli* from fresh eggs is its removal from the oviduct by leucocytic activity.

That the colon bacilli are often found in egg preparations is therefore evidently due to contamination with faeces during manufacture.

The bacterial content of canned eggs may be greatly reduced by separating only clean eggs, as the contents may easily get contaminated in this operation, which is carried out by hand. All soiled eggs should be utilized without separating the white from the yolk. The girls who break the eggs should wash their hands each time they come in contact with the contents of bad eggs or other contaminating material. All utensils should be made so that they can be readily washed.

II. In his discussion of the properties and wholesomeness of egg products, the writer comes to the following conclusions, due to his own researches and to those of others:

1. In the absence of physical signs of decomposition, there is no danger of poisonings or bacterial infections through egg products.
2. Bacteriological methods for judging the wholesomeness of egg preparations are unnecessary and inapplicable.
3. The sanitary conditions under which frozen and desiccated eggs are produced cannot be judged by our present bacteriological methods, because the bacterial content of egg preparations is subject to great seasonal and local variations.
4. Factory inspection should enforce sanitary methods of production, and should exclude from the frozen and desiccated products all eggs that are not admitted to the market in the shell.

5. All tanner's eggs should be denaturized to prevent their use as food products.

6. The bacterial contents of desiccated eggs can, by keeping them for from one to two hours at 65° to 70° C., be greatly reduced without decreasing their solubility very much. Practical tests will have to decide whether the advantages gained from the lower bacterial content would counterbalance the disadvantages arising from the somewhat lower solubility.

III. The writer further made some experiments upon the bacterial infection of eggs during their formation.

He used the eggs of 70 hens from one to three years old. These were in two pens, the birds in each being treated exactly alike except for a difference in feeding. About 600 eggs were bacteriologically examined and a larger number were placed in incubators. The results of the investigations were as follows:

1) 18.1 per cent of the total number of eggs analysed showed bacterial growth at room temperature, while only 8.3 per cent showed growth at 38° C.

2) Of the infected eggs, 82 % were infected in the yolk, 25.9 % in the white, and only 7.9 % in both white and yolk.

3) The bacterial content of eggs undergoes great seasonal changes, generally increasing with the rise in temperature.

4) No definite relation can be traced between the bacterial content of eggs and their hatching qualities.

5) No relation could be found between the age of the fowls and the bacterial content of their eggs.

6) No definite influence of the fattening ration upon the number of eggs infected and upon their hatching qualities could be observed.

BEES.

944 GRANDERYE, L. M. **Rapid Analysis of Honey.** (Analyse sommaire du Miel). — *La Vie Agricole et Rurale*, No. 20, p. 550. Paris, 13 avril 1912.

France

The complete analysis of honey is complicated; it can only be carried out in a well-equipped laboratory by a professional analyst, especially if it is a question of distinguishing bees' honey from artificial honey (a mixture of glucose and highly scented honey), and sugar honey (from syrup-fed bees). The presence or absence of traces of certain substances: furfurol, various mineral matters, etc., alone serves to distinguish one kind of honey from another.

For merely detecting frauds, and finding out what substances, useful or not as food, have been mixed with the honey as adulterants to bring more profit, a rapid analysis can be made, which does not require more than a little care. The following scheme shows the method:

In 100 *cc. of rainwater dissolve* 10 *gr. of the honey: shake well:*
A. The liquid is cloudy.
  To 10 cc. add 1 cc. of HCl:
  I. The liquid becomes clear.
    Add one or two drops of HCl:
    (*a*) Remains clear . . . . CHALK.
    (*b*) Turns cloudy. . . . . GYPSUM.
  II. The liquid remains cloudy . . . . KAOLIN.
B. The liquid is clear.
  To 10 cc. add 3 or 4 drops of iodine water:
  I. The liquid becomes coloured.
    (*a*) Blue . . . . STARCH (from grain or potatoes) or FLOUR.
    (*b*) Reddish . . . . DEXTRIN.
    (*c*) Dull violet . . . . DEXTRIN and STARCH (from potatoes).
  II. No coloration appears.
    To 10 cc. of the original solution add 10 cc. of tannin:
    (*a*) A greyish precipitate is thrown down . GELATIN.
    (*b*) No change . . . . PURE HONEY, SUGAR HONEY, GLUCOSE HONEY.

SILKWORMS.

945 **Government Enquiry into the Cultivation of Mulberry Trees in France.** (Enquête sur la culture du Mûrier). — *Bulletin Mensuel de l'Office des Renseignements Agricoles*, No. 3, pp. 333-337. Paris, mars 1912.

France

In order to find the means of increasing the production of silk and of silkworms' eggs, the French Government has charged a commission with the study of the whole question of silkworm rearing.

From the enquiry carried out by the professors of agriculture of the 22 Departments in which cocoons are produced, and by the directors of the silk-worm stations, the following information and conclusions are drawn:

In 1911 there were in France 102 605 silk-worm breeders who incubated 141 724 ounces of eggs (ounces of 385.8 grains avoir.) producing 5028.7 tons of cocoons, with an average of 75.31 lbs. per oz. of seed.

The averages of recent years were:

		1894-1903	1904-1911
		—	—
Silk-worm breeders . . .	no.	134 206	119 409
Eggs incubated	oz.	203 367	178 760
Weight of cocoons	tons	8046.4	7146.1

Statistics show that, notwithstanding the bounties on production, the rearing of silk-worms in France is constantly declining.

Considering that the rearing of 1 oz. of eggs requires from 1430 to 1540 lb. of mulberry leaves, the total amount of eggs incubated in 1911 represents a consumption of 97 639 tons of leaves. The enquiry commission states that the amount of leaves produced exceeded the consumption by 95 400 tons. Consequently it is not in the shortage of mulberry leaves that the causes of the crisis of the French silkworm-rearing industry are to be sought.

Still the travelling professors of agriculture complain that farmers do not bestow proper care on the cultivation of their mulberry trees, which are frequently ruined by careless pruning or by insect and other pests which are not checked. What is wanted is not to increase the number of trees, but to improve the vigour of those at present existing; and to replace the trees that are too old. The winter pruning should be performed at most every three years; the mulberry trees should be manured with farmyard manure and artificials, especially phosphates; every year the ground about the trees, should be ploughed, and nurseries should be provided for the free distribution of young plants to small farmers. This last measure is accompanied by the proviso that the distribution of plants, either free or at reduced prices, would not be sufficient to solve the problem.

The necessity of improving the system of pruning is especially urgent in those districts where mulberry leaves are used also as food for live stock.

Planting mulberries along roads would be useful only for country roads. The mulberries cultivated in France are the following:

White mulberry.
Black mulberry.
Wild mulberry.

The first with its many varieties is the most prevalent throughout the silk raising regions of France. The other varieties are:

The grey variety (Ardèche).
The rose coloured (Ardèche, Bouches du Rhone, Drôme, Gard, Hérault).
Moretti variety (Drôme, Vaucluse, Ardèche).
Multicaulis variety (Ardèche, Hérault).
Black mulberry (Corsica, Basses Alpes).
Wild mulberry (Corsica and Hérault).

Conclusions:

Owing to foreign competition and the present state of the labour market in the French silk-producing districts, the French silkworm rearing industry is at a stand-still and will not be able to develop further until the economic conditions of production become more favourable.

The only silk-worm rearing that can thrive in view of the low price of cocoons is the home industry assisted by State bounties. In the homes of the labourers and small landowners the members of the family can supply all the labour required for one or two ounces of seed.

The causes of the decline of the French silk-worm rearing industry are all economical, namely: the low price of cocoons, the competition of oriental countries and the exodus of the rural population which causes the high price of labour.

FISH.

WALTER, DR. AUGUST. **The Destruction of the Fish Leech in Carp Ponds.** (Die Vernichtung des Fischegels in Karpfenweihern). — *Allgemeine Fischerei-Zeitung*, XXXVII. Jahrgang, No. 9, pp. 238-239. München, 1. Mai 1912. **946**

Germany

The fish-leech (*Piscicola geometra*) is a very harmful parasite in carp ponds, and the freeing of the fish from this pest when the ponds are cleared is troublesome; it is best done by placing the carp for a short time in a solution of common salt.

At the fishery station of Schwarzenfeld, an attempt was made to free the ponds from *Piscicola geometra* by drawing off the water, sprinkling quick-lime ower the bottom and subsequently refilling them.

The number of leeches was certainly much reduced, but the pests were not exterminated. But one pond, when cleared of fish in the autumn, was found to be quite free from fish-leeches; it had been treated with quick-lime in the same manner as the others, but had also been completely cleared of projecting water-plants (bull-rushes, club-rushes, and reeds) at the end of June and the beginning of July; the plants were dried and used as bedding for cattle. The removal of these plants must have been the cause of the extermination of the fish-leeches. The next year, the plants were removed in like manner from another pond with the same success; no fish-leeches were discovered there in the autumn. In the subsequent year all the ponds were thus successfully treated.

The writer thinks that just at the time in question, the end of June to the beginning of July, is the time of mating and egg-laying of the leeches; the latter fix themselves to the portions of plants which are beneath the water, and also deposit their cocoons there.

In this way the connection between the freeing the ponds from water-plants and the disappearance of *Piscicola geometra* is explained.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

947 **Considerations on the Present Status of Agricultural Machinery in France.**

(1*) RINGELMANN, MAX. Les machines au concours général agricole de Paris. — *Journal d'Agriculture pratique*, 76e Année, Nos. 10, 11, 12 et 13, pp. 304-308, 335-338, 372-374, 403-406. Paris 7, 14, 21, 28 mars 1912.

(2*) DE CONDÉ, F. Les machines à traire et les appareils de laiterie au Concours général agricole de Paris. — *Journal d'Agriculture pratique*, 76e Année, No. 14, pp. 466-468. Paris, 11 avril 1912.

(3*) BÉNARD, M. J. Le Motoculteur. — *Bulletin des séances de la Société Nationale d'Agriculture de France*, 75e Année, No. 3, pp. 254-255. Paris, 1912.

(4*) DUFAURE, M. G. Rapport sur l'expérimentation des machines agricoles effectuée à Chelles et à Chantilly. — *Bulletin de la Société des Agriculteurs de France*, 44e Année, 1er fascicule, supplément au Bulletin du 1er avril, pp. 145-155. Paris, 1er avril 1912.

(5*) COUPAN, BERNARD, BALLU, COMON, SAINT-MAURICE, CARON, LUCAS, FONTAINE. Les machines agricoles en 1912. — *La Vie Agricole et Rurale*, No. 19 (spécialement consacré aux machines agricoles), pp. 481-528. Paris, 6 avril 1912.

(6*) LEJEAUX, JEAN. Le travail complet du sol par le Motoculteur. — *La Vie à la Campagne*, No. 133, pp. 220-222. Paris, 1 avril 1912.

France

The total value of the agricultural machines and implements used in France is about 4000 millions of francs (about £160 000 000), while that of the farm buildings is about 10 000 millions (about £400 000 000). But if it be remembered that machines last, on average, only about 10 years, while buildings stand at least for 50 years, it becomes evident that the equipment of agricultural machinery and implements necessitates an enormous circulation of capital.

The actual position of farm machinery is reviewed under the six following heads:

1. MACHINES FOR TILLING THE SOIL. — According to the official documents of agricultural statistics, there are for every 100 acres of total area, 84 acres under cultivation (this extent comprises arable lands, vineyards, natural meadows, permanent grass lands, woods, forests and orchards) of which 49 acres are ploughed lands. It is calculated that every 100 hectares (247 acres) of arable land requires 14 ploughs. This figure in rather high owing to the great extent of area occupied by small and medium-sized farms.

The use of *Double reversible Brabant ploughs* is spreading more and more, as they leave the surface of the ploughed field flat, which facilitates the work of drills, mowers and reapers. For average deep ploughing, M. Bajac has devised a double-furrow balance plough (1*) for animal or mechanical traction to replace the double-furrow Brabant reversible ploughs which are so cumbersome to turn at the end of the furrow. This plough is very light, it has no seat, and the axle of the bearing wheels is provided with an *anti-balance* device to keep it easily to its work. The same constructor has built a balance plough for shallow work (1* and 5*) (stubble plough) for mechanical traction. The central part of the frame rests on a sheet iron roller which passes over the furrows made by five ploughshares; the driver occupies a seat in front of the beam and steers the plough by means of a lever acting on the wheel in the furrow. The position of the driver and the point of haulage ensures steady working in hard and dry soils; the depth of the furrow is regulated by the steering wheel and by the central roller.

Among mechanical ploughing machines a distinction must be made between steam engines, internal explosion motors and motor ploughs.

Steam engines. Two novelties to be mentioned are: a small road machine *l'agromotive* (1* and 5*) of 8 to 10 HP. and weighing fully equipped, 5000 kg. (4.92 tons); a road traction engine *Case* (1* and 5*) of 14 to 45 HP. and weighing 8 500 kg. (8.36 tons). At the Chelles trials, this engine, whose normal speed is 5 km. (about 3 miles) an hour, hauled a Deere 4-share plough at the rate of 2 to 2½ km. (1.24 to 1.55 miles) an hour, in moist very heavy clay.

Machines provided with explosion motors. — In this class the *Mogul traction engine* (1* and 5*) deserves mention; in full working order it weighs 5000 kg. (4.92 tons); it is fitted with a 25 HP. oil engine. The hind wheels, which are the driving wheels, are wide and high, and in dealing with excessively moist ground, they can be fitted with sheet iron rims which bring up the total width of the tyre to 0.75 m. (30 inches). The grip necessary for haulage is due only to the weight of the machine.

In the *Lefebvre traction engine* (1* and 5*), on the contrary, the weight is reduced to 2 500 kg. (2.46 tons) for a power of 25 to 30 HP. and purchase is obtained by means of two endless chains fitted with blades which penetrate the soil. Thus a force of 1000 to 1200 kg. (0.98 to 1.18 tons) is available for hauling a strong balance plough.

M. A. Bajac's traction windlass (1* and 5*) is the most interesting novelty. With this system it is not only possible to plough deeply or superficially but also to haul scarifiers, harrows, rollers, mowers, reapers and binders, and vehicles. It can be used for removing timber from forests and as power for threshers, balers, mills, pumps, dynamos, etc. As for ploughing, should the power required exceed a certain limit, the motor starts alone at its greatest speed, paying out, as it goes, a steel cable, then stops at a certain distance, not above 200 metres (about 660 ft.) and anchors itself automatically, after which the drum is thrown into gear. The whole force of the motor is utilised in hauling the plough up to the motor. Then the drum is ungeared, the anchors lift automatically, and the motor moves on again alone. With this system there is no waste of time for preliminary taking up position, so that the heaviest ploughing can be done with only two men, one at the motor, the other at the plough. The motor has four cylinders, it is built in two sizes 24 to 30 HP. and 30 to 35 HP. M. Ringelmann tried the 25 HP. machine in practical work extending over a long period.

The motor travelling alone on a road with a gradient of 9 to 12 per cent., which it ascended at its 3rd speed, gave the following results :

Average practical speed per hour . . .	9.04 miles
Average consumption of benzine per mile	0.154 gals.

The same motor, on a road about 1 mile in length having a gradient of 3 and 5 per cent, hauling a three-furrow balance plough weighing 1.08 tons gave :

Average practical speed per hour . . .	7.79 miles
Average consumption of benzine per mile	0.17 gals.

In ploughing two trials of different nature were made :

1. Breaking up a clover lea on marl to a depth of 7 inches with a three-furrow balance plough weighing 1.08 tons. The length of the furrows was 2296 ft. which was divided into 4 laps.

In 10 hours two men ploughed 6.17 acres; consumption :

		s	*d*
13.2	gals. of benzine . . .	11	10 ¾
0.946	» of oil	2	2 ½
	Total . .	15	1 ¼

or 2*s* 5 ¼*d* per acre.

2. Deep ploughing in loam at a depth of 13.8 to 15 inches, by means of a double-furrow plough weighing 17.9 cwt. The field was 2460 feet long and it was ploughed in 4 laps. In 10 hours two men ploughed 3.08 acres ; the consumption was :

	s	*d*
12 54 gals of benzine . . .	11	3 ¾
0.946 » of oil	2	2 ½
Total . .	13	6 ¼

or 4*s* 4 ¼*d* per acre.

For subsoil ploughing or for heavy ploughs working to a depth of 24 inches, a pulley is used, thus doubling the power, but of course the length of each lap is reduced to one half.

Motor ploughing machines. — These apparatus differ from the preceding, in that the driving and the working parts are mounted on the same frame.

The *Gilbert motor ploughing machine* (1* and 5*) is fitted with an oil motor, and has two disks loose on an oblique axle; purchase is obtained by means of thick blades which, while revolving with the driving wheels, shift their position on the tyre. An 8 to 10 HP. machine which took part in the Chelles trial had only one disk which was driven by the motor and revolved in the opposite direction to that which it would naturally follow when travelling over the ground.

The *Landrin ploughing machine* (1* and 5*) with a 20 HP. oil or bezine motor has at its back a series of disks whose axle is caused to revolve by the motor. Purchase on the soil is obtained as in the preceding machine. The disk axle can be dismounted and the machine can be used for hauling scarifiers, harrows, rollers, etc.

The Koszegi ploughing machine (1* and 5*) is provided with a 60 to 70 HP. motor, and 10 sheet-iron disks mounted on a shaft parallel to the axle of the wheels. Each disk has six radial blades terminating in small pointed scoops which are the real working parts.

The *Meyenbourg motor cultivator* (3* and 6*) is an apparatus for pulverising the soil. The working part consists of a shaft, geared directly on the driving wheels, on which are arranged rows of supports, each of which bears a series of four steel hook shaped prongs, fastened to a strong and elastic spiral spring. The prongs cost only about a halfpenny each, so that the cost of replacing those that are broken or worn out is insignificant. This apparatus was tested on a large extent of ground during a week at Massy Pelaiseau. Its motor is 15 HP.; the breadth of ground that it cultivates is 7 ft. 5 in. and its total weight is only 1.3 tons.; working 10 hours it consumes 2 gals. of benzine and it can cultivate superficially 19 to 24 acres a day. By means of moveable runners the depth of work may be varied from 2 to 10 inches, at which latter depth, in a good moderately moist soil the machine can till at least 2 ½ acres a day, provided it be fitted with a 30 HP. motor.

2. MACHINES FOR SPREADING MANURES AND SEEDS. — Among manure spreading machines, *centrifugal distributors* allow the spreading of substances possessing a certain degree of cohesion : superphosphates, nitrates, potash salts, cyanamide, etc., which choke other distributing systems and make spreading uneven. They may also be used for spreading caustic substances, insecticides or seeds.

The *Express drill* (5*) is entirely built of metal; it consists of two large hoppers of the shape of truncated cones, and of the total capacity of 3.3 bushels, in which the manure is placed. At the bottom of each hopper a horizontal stirrer with six arms is situated which pulverises the fertiliser and pushes it towards the outlet, the aperture of which can be regulated at will. Below each outlet, there is a tube, the inclination of which can be varied, and which opens over a rotating plate. There are two of these plates, revolving rapidly in inverse direction to each other ; they are driven by a series of gears on the driving wheels.

There is a small-sized machine, with only one plate, for small farms.

The breadth of work done varies from 9 ft. 6 in. to 33 ft. ; clover seed is spread for a breadth of 24 ft. 6 in. ; wheat, barley and nitrate of soda 29 ft. 6 in.; basic slag, dehydrated sulphate of iron and superphosphates 11 ft. 6 in. to 13 ft. Lastly, a special arrangement allows of the manure being spread in lines.

As for drills, those machines which sow in continuous lines and at the same time are fitted with devices for sowing in little heaps or interrupted lines are being actively developed. Sowing beets in little heaps allows of an economy of 50 % being made, but sowing in interupted lines is to be preferred, for the greater facilities it offers for singling.

3. MACHINES FOR INTERCULTURE. Three interesting machines deserve mention : one is *Bajac's motor hoe* (1* and 5*) with six tines. The hind wheels are driven by an oil or benzine 10 to 12 HP. motor.

The whole weighs 1.47 tons, and requires two men, a driver in the seat and an assistant who follows the machine, working the steering lever of the frame bearing the blades.

The *Mesmay motor-hoe traction engine* (1* and 5*) can be used either for the hoeing of lines of plants or for hauling any light machine. It weighs only 18.7 cwt. and carries a 6 HP. motor. The hoe blades are placed on a cross bar jointed to the back of the frame.

Chouchack's motor hoe and pulveriser (1* and 5*) is fitted with a 10 HP. motor ; the two driving wheels are in front of the machine and a seat and steering wheel at the back. The speeds at which it travels are 1 ¼, 2 ½ and 5 miles per hour. Between the steering and driving wheels, is situated a drum bearing curved blades which work as revolving hoes, and against which scrapers act for detaching the earth, pulverising it and throwing it backwards. The speed of the extremity of the hoes is 7.22 ft. per second when the whole machine travels at 1.8 ft. per second. It weighs 18.7 cwt. in full working order ; the breadth of tillage done is about 3 ft. 3 in. and about 0.4 acre can be hoed in an hour, with a consumption of about 7.7 lb. of clear petroleum.

4. *Harvesting machines.* At Chelles (4*) (Seine-et-Marne) several machines for mowing grasses intended to be made into stooks were tested.

The *simple mower* was found quite insufficient : the mowed plants fall in all directions, and do not allow a stook to be made easily; it does not stand up well and is easily soaked through by the rain. The *Merveilleux,* a mower provided with a drum fixed behind the knife, is better ; the plants are not entangled and allow of their being gathered into stooks, but both the above machines require two men to follow them. The reaping machine requires only one man and mows satisfactorily both first cut and aftermath.

The hay was turned with the old fork-tedders, with Martin's swath-turner and with two-horse side-delivery rakes, Puzenat's and Massey Harris'. The two latter gave the most satisfactory results, and are superior as rakes to Martins one-horse rake, as they collect the hay into compact windrows which stand the rain well.

Among stacking apparatus *Watripon's hay stacker* must be mentioned. It consists of a vertical cylinder (13 ft. diam. × 13 ft. high) built of iron rods and lattice work ; it is mounted on low wheels ; it opens at the back and its bottom can be lowered. Two men fill it with hay while a third presses it down. When full, the stacker is drawn by four oxen to the site of the stack, the back is opened, the bottom is lowered and the oxen being driven forward the hay is deposited on the ground.

Recently an automatic device has been invented for the prevention of accidents with mowers and reapers when the driver has neglected to throw the machine out of gear before alighting. This apparatus is mounted on a small shaft and is worked by a spring which rises when the driver gets off.

5. MACHINES FOR PREPARING THE HARVEST FOR SALE OR CONSUMPTION. — According to the data supplied by some farms it ap-

pears that a threshing machine and an 8 HP. motor are required for every 100 ha (247 acres) under cereals. Among cereal threshers no novelties have appared. Among clover threshers, *Duval's dodder screen* (1* and 5*) deserves notice. It is mounted on a thresher for small seeds and completely frees clover seed from dodder and plantain seeds.

The new *Simon bolting mills* (1* and 5*), driven by a 1.5 HP. motor, work 132 lb. of wheat per hour, yielding 55 % of flour for bread making.

6. MILKING AND DAIRY MACHINES (2* and 5*). — Among these *Loquist's milking machine* is worthy of notice. It is of the pressure type and its chief parts are a moveable rubber plate mounted on aluminium, working against a fixed plate ; the action of the moveable plate is to compress the teat progressively from its base to its nipple, as in hand milking ; a small electric motor works the plates, which, in couples, fit the teats.

A great advantage, from a hygienic point of view, of this milker over suction milkers is the absence of all rubber pipes, consequently it is so much easier to clean and to keep sweet.

In *Hirsch's apparatus for cleaning milk cans*, the can is placed horizontally on four small wheels which cause it to rotate on its axis, two brushes are placed parallel to the sides of the can, one inside, and one outside, and along the line of contact two pipes sprinkle either pure water or a solution of potash, after which a jet of steam terminates the operation.

EXPERIMENTS ON THE USE OF ELECTRICITY IN AGRICULTURE (4*). These were carried out at Chantilly, with the following results.

1. *Threshing machines.* — A. Thresher for medium sized farms, weighing 39 cwt., with double cleansing outfit, a separator for small straw, a feeder and a binder ; the beater makes 900 revolutions. Running idle the machine and accessories require 3 kilowats per hour ; working 4 to 4.5, without accessories 3.2 KW. It can thrash from 1800 to 2000 sheaves in 10 hours. B. Thresher with double cleansing outfit, separator for small straw, and straw-weigher, thrashed minimum of 1000 sheaves a day; the beater makes 700 or 750 revolutions; running idle the machine requires 2.1 KW., when working 2.8 to 2.9 KW.

2. *Root slicer.* It makes 150 revolutions and slices about 13 tons of mangels per hour. Running idle it requires 0.75 KW. per hour, working 1.85 KW.

3. *Roller.* It makes 250 revolutions and rolls 550 lb. of oats per hour.

It requires for running idle 0.85 KW., and for working 1.2 KW.

4. *Combined mill.* The roller makes 150 revolutions and the mill 500.

It rolls 1160 lb. of oats per hour. Empty it requires 0.9 KW. and working 2 KW.

5. *Oil-cake breaker.* — It has a single roller fitted with tempered steel teeth, arranged in spirals. The concave has apertures in which the points of the teeth pass. The roller makes 150 to 200 revolutions and breaks about a ton and a half of linseed cake per hour. Empty it requires 0.48 KW. and working 0.72 KW.

Manure mixer. — The screw shafts in the hopper make 30 revolutions and mix intimately about 60 cwt. of manure per hour. It requires, running idle 0.6 KW. and working 2.6 KW.

948

A New System of Machine Ploughing.

1. BELLUCCI, A. and GENNARI, G. Un nuovo sistema d'aratura meccanica. — *Cattedra Ambulante d'Agricoltura per la provincia di Ravenna*, pp. 1-14. Ravenna, 1911.
2. COSTANTINI, C. L'aratura meccanica col sistema Missiroli. — *Società degli agricoltori italiani*, Anno XVII, No. 5 pp. 127-131. Roma, 15 Marzo 1912.

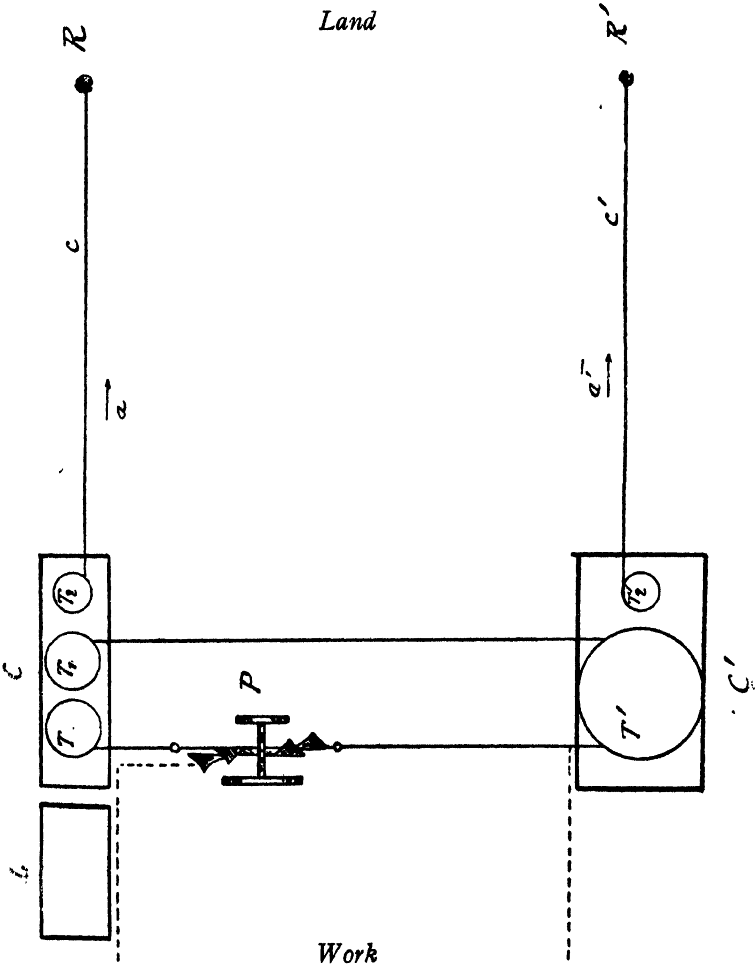
Italy

This is a system of two independent trucks C and C^1 (fig. 1) bearing drums driven by steam, electric or internal combustion power. Hitherto the outfit has been driven by a portable steam engine. The truck C is solidly attached to the engine with which it can travel in the direction *a*. This truck is provided with three vertical drums round which $^5/_8$ inch steel cables are wound. The two drums T and T_1 haul the plough. The drum T_2 hauls the cable *c* which is firmly anchored in R and causes the motor and the truck C to progress towards *a*. The truck C, placed at the other extremity of the field bears two vertical drums of which the larger one, T, is connected with the drums T and T_1 of C, and hauls the plough; the other drum T'_2 corresponds to T_2 and causes C' to advance towards *a'* by winding the cable *c'* anchored in R_1. When the plongh is at one end, A_1 of the field the driver throws into gear T_2 and T'_2, either at the same time or successively, and causes one or both trucks to advance towards *a* and *a'*. After having proceeded for a determined distance, which can be regulated at will, the trucks stop *automatically*. The operations of stopping and displacing the trucks can be carried out without stopping the motor. The outfit is completed by a two-furrow balance-plough.

capable of working to a depth of about 12 to 16 inches. The length of cable required is from 2 600 to 3 300 feet.

This system has given very satisfactory results both as to the quality of the work done and to its economy. In the province of Ravenna on heavy clay soils which had been under lucerne for eight years, the following data were obtained:

Breadth of strip ploughed	30.3 inches.
Depth » »	13 to 16 ¹/₄ inches.
Velocity of plough	42 ½ inches per second.
Time employed for tilting the plough	50 seconds.
Area ploughed in 10 hours	2 380 to 4 141 sq. yards.



To work the outfit five men are necessary, a driver, a fireman, two men at the plough, and a man with a pair of horses or oxen to supply the engine with water.

Working one hundred days in the year the total cost is as follows (assuming the price of the whole outfit to be £ 1 190,10*s*, its duration 15 years, and the rate of interest 5 %).

		£	*s*	*d*
Amortisement of capital		64	4	1½
Interest		59	10	5 3/4
Repairs		47	12	4½
Coal (787 cwt. at 3*s* 6 3/4 *d*)		71	8	6 3/4
Lubricants		7	18	8 3/4
Carriage of water		31	14	11
Labour	Driver	31	14	11
	Stoker	19	6	10
	2 men at plough	31	14	11
		£365	5	10 1/4

If the outfit ploughs about 5 acres per day (which is less than what has been hitherto accomplished) the cost per acre is about £1,4*s* 9*d*. If the amortisement extends over 10 years only, the cost per acre rises to £1,7*s*. 4*d*. At present ploughing to the same depth with oxen costs 22*s* 6*d* to 24*s* 1*d* per acre.

949 HÖLTZERMANN, FELIX. **A New Weed Extirpator, the Raesak, and an Improvement in Drill-Coulters.** (Ueber den « Raesak », (Schneider), und über Drillsaatschare). — *Deutsche Landwirtschaftliche Presse*, XXXVII. Jahrg., No. 31, pp. 364-365 ; XXXIX. Jahrgang, No. 31, pp. 364-365 ; No. 32, p. 378. Berlin, 30. April 1910 u. 17. u. 20. April 1912.

Germany In the South of Russia an implement, the « Raesak », is used for tilling fallows and for destroying weeds (See fig. 1). In its recently improved form the Raesak consists of a pair of shafts, joined at their butt ends by cross bars, which support the cutting apparatus. This consists of a cylindrical cross beam in which one end of the supports of the knife is fixed, the other extremity being riveted to the knife, which is of 0.24 × 1.57 inch Bessemer steel. It is 7 ft. 6 in. long ; its cutting edge is slightly inclined downwards. The knife supports are made of flat iron, and their lower part is knife shaped and bent forward so as to prevent weeds dragging. The cylindrical cross beam is attached to the shafts by two rings in

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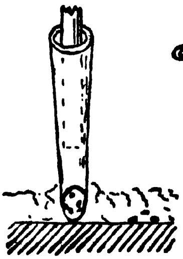

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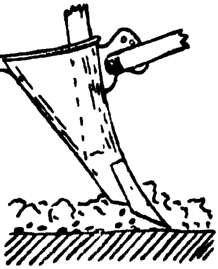

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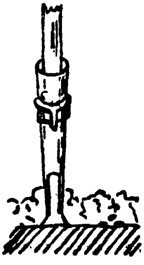

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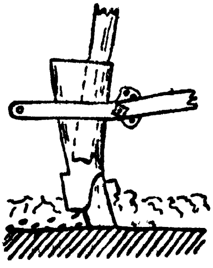

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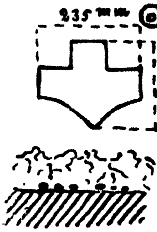

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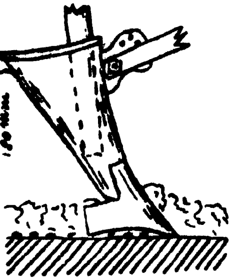

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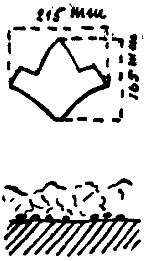

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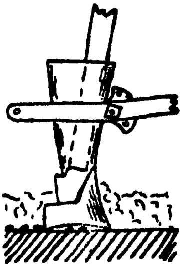


V b.

which it can be made to revolve, being provided with a handle for this purpose, and thus the inclination and the depth of the cutting apparatus may be varied. When the blade is pushed up to the shafts the implement is in a position for transport. It rests then behind on two runners which are hinged at the butt ends of the shafts. These runners facilitate also the cleaning of the implement at intervals during work, for if the horse is stopped and backed a step the runners pivot in the ground and lift the whole implement.

With the « Raesak » and one horse, upwards of 12 acres can be tilled in 10 hours. On harrowed fields it does excellent work if dragged across the furrows; it then cuts or breaks all the roots of weeds at a depth of a few inches below the surface, much better than by the use of paring ploughs or extirpators which by the inclination and shortness of their cutting parts allow many weeds to escape destruction. Besides, these implements cannot be adjusted to such shallow work as the Raesak can easily perform, and which is especially valuable for dry regions.

Harrowing and then tilling with the Raesak leaves the field covered with a thin layer of fine mulch which prevents evaporation. Under this mulch there is a layer of moist earth that has been smoothed by the Raesak blade and forms a very good seed bed in which the seeds germinate rapidly and uniformly.

The drills to be used must sow the seed in a special manner. Most European drills have pointed coulters which open a narrow furrow and drop the seed into it; at the same time a good deal of the fine dry mulch falls into the furrow and buries the seed which thus does not benefit from the moist earth. American drills are better in this respect; they are fitted with coulters somewhat broader at the foot, which allow a certain proportion of the seed to fall on the moist earth, though the rest is surrounded by the dry mulch.

The author has consequently fitted the coulters of Messrs. Hoosier and Elworthy's American drills (see fig., II and III, *a* and *b*) with sheet iron side guards (see fig., IV and V, *a* and *b*) to prevent the fine earth from falling too rapidly into the furrow. All the seeds thus reach the layer of moist earth and germinate rapidly and uniformly. The above method, upon the author's recommendation, has been adopted in the South of Russia.

950

JANIN, GEORGES. **The Mashing of Jerusalem Artichokes.** (Le broyage du Topinambour). — *Journal d'Agriculture pratique,* 76e Année, No. 14, pp. 431-432. Paris, 4 avril 1912.

France

Jerusalem artichokes, on account of their irregular shapes, are very difficult to clean, and the most improved type of root-washing machines, though they may wash the tubers properly, are powerless to free them from stones.

This is a serious inconvenience if the tubers are to go through root slicers, especially if these are motor driven, because a single stone is enough to cause serious damage to the machine. But instead of the slices produced by a root cutter, the pulp made by a crusher might be used.

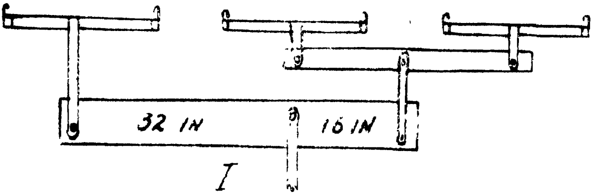
The author, after having unsuccessfully tried an apple crusher fitted with blades and spring counter-plate, adopted a Mabille crusher with a moveable cone, which has given him full satisfaction. The apparatus makes only 60 revolutions per minute, requiring 1.5 HP., and turns out 1 to 1.2 tons per hour.

The tubers are reduced to a pulp which makes an excellent mixture with chaff, chopped straw, oil cake, etc. If a stone finds its way into the hopper, there are three alternatives: 1, if the stone is less than 1 ½ inch in diameter a spring allows the cone to shift enough to let the stone pass and then to resume its position; 2, if the stone is larger and not very hard, it is crushed; 3, if it is very hard it jams between the teeth of the cone, the crusher stops and the driving belt slips. Owing to the low speed of the cone shaft, which by means of an intermediate gear makes only 30 revolutions per minute, and to the resistance of the whole apparatus, there is no danger of breakage.

This crusher has been at work for several months without causing any trouble at the St. Michel de Chédigny farm, where part of the cattle food is cooked by machinery. The resistance of the cone teeth revolving slowly is much superior to that of the best root slicing blades making 100 or 150 revolutions per minute.

951 **Three - Horse Eveners.** — *The Missouri and Kansas Farmer*' Vol. XXVII, No. 15, p. 13. Kansas City, April 1, 1912.

United States



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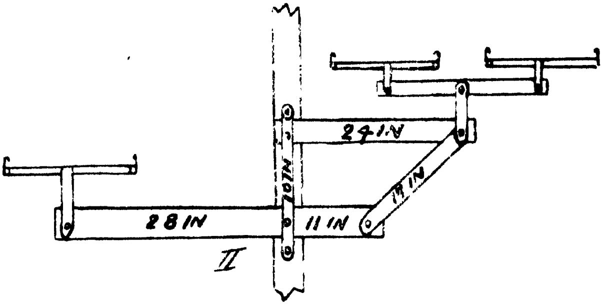

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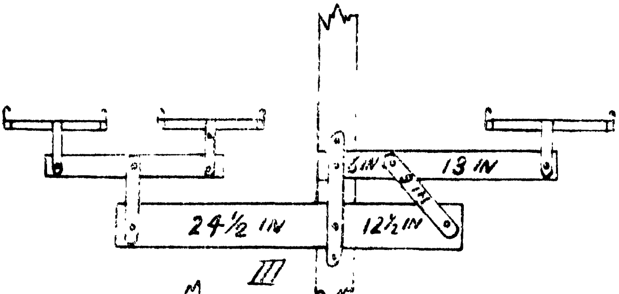
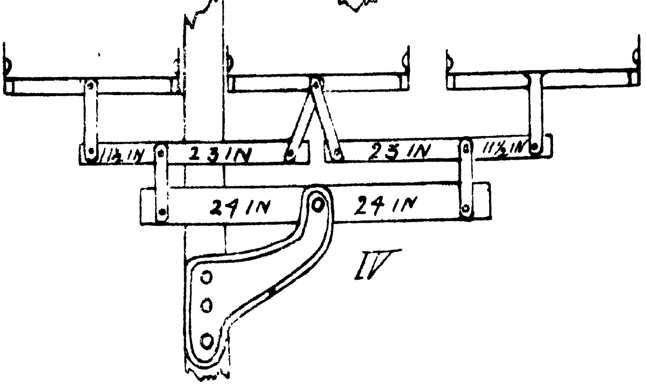


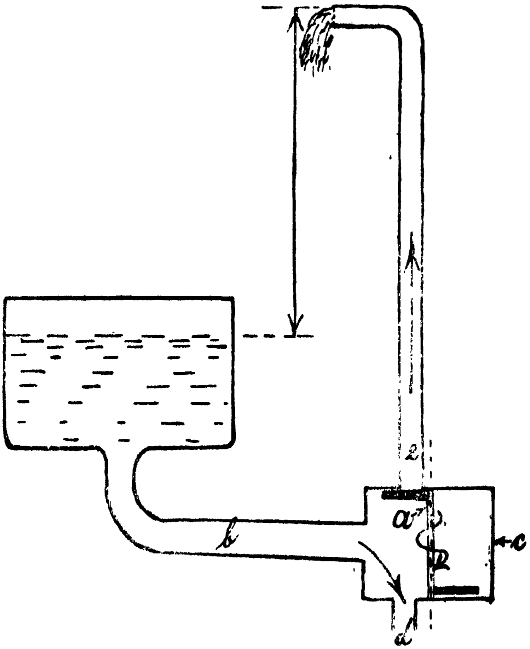
III



IV

A New Method of Raising Water by a Hydropulsator. (Eine neue Art der Wasserförderung durch Hydropulsator). — *Der Kulturtechniker,* XV. Jahrgang, No. 2, pp. 151-153. Breslau, 15 April 1912. **952**

Hr. Abraham, a Berlin engineer, has constructed a hydropulsator, which works in the same manner as a ram, but is free from the disadvantages of the latter. The two valves of the ram are **Germany**



replaced in the hydropulsator by a device (see figure: *a*), which has curved blades like those of a turbine. This piece is continually revolved by the stream of water which flows through the pipe *b* into the chamber *c*, and closes alternately the discharge-pipe *e* and the outflow-pipe *d*. As long as the outflow-pipe is open, the water flows through it; and the speed of the water increases until the pipe *d* is closed. After the closing of this pipe, however, the water flows first with considerable speed into the chamber *c*, and rises thence into the discharge-pipe *e*, which has in the meantime opened, until the speed in the supply-pipe *b* becomes nil.

In the interval, the device *a* has revolved, owing to the decreasing velocity of the flow of water into chamber *c*; the discharge-pipe *e* has thus been closed, the outflow-pipe opened, and the whole process, which has just been described, is repeated.

The apparatus can be made in large dimensions and does not require much head of water; it has already proved itself to be practicable.

Measurements made have shown a 70 % efficiency.

958 **The Use of Small Railways in Fields and Forests.** (Bahnen für die Forst-und Landwirtschaft). — *Maschinen-technische Rundschau*, Nr. 1-3, pp. 2-6. Königsberg, März 1912.

Germany

Transport by railway requires less traction force on account of the slight friction of the wheels upon the rails. The following table gives the relative coefficients of resistance on level ground.

Nature of the line	Resistance coefficient
Ordinary soil	0.1
Rocky soil	0.03
Rails	0.006

According to the definition of the coefficients of resistance, it is seen that with a force of 75 kg. it is possible on ordinary ground to displace a weight of $\frac{75}{0.1} = 750$ kg.

On rails $\frac{75}{0.006} = 12\,500$ kg. can be displaced, or 16.6 times as much.

When a railroad is to be laid down, the following factors should be taken into consideration: the length of the line; the utilization of existing railroads, or the making of a new one; the kind of ground to be traversed; the transport of the material all at once, or in several journeys; the quantity of material to be transported per day or year; the nature of the substances to be transported (bulk, shape, density); the time of utilization; the nature of the motor-force (animate or inanimate).

With regard to the choice of the motor force, it is advantageous to replace ten horses by a locomotive, and in this case, the capacity of each truck should be at least 3000 kg. (3 tons). The rolling-stock can be in use for 10 to 15 years, at the end of which period it is still worth 25 % of its original value.

With regard to the cost of loading and unloading material which is to be transported, the following figures may be given per ton:

	d
Coarse goods	1.5
Coal	1.8
Rather fragile goods	3
Fragile goods	6

In a large exploitation, to effect the transport of 300 000 qls. (nearly 30 000 tons) of goods over a distance of 6 km. (about 4 miles) the necessary expenditure of capital is as follows:

	£
6000 m. (6560 yds.) of rails (vertical section 70 mm., 2.7 in.) plus accessories (iron)	700
6666 m. (7288 yd.) of sleepers	200
46 tilting trucks without breaks of 2 cub. m. (2.6 cub. yds.) capacity	800
4 tilting trucks, with breaks, of 2 cub. m. capacity	80
15 turn tables	80
2 locomotives	600
Cost of ground	200
Preparation of the line	820
Laying the lines and plates	150
Total	£3630

The annual expenditure can be estimated as follows:

	£	s
Interest of capital expended on the purchase of the land and the construction of the line	50	2
Interest and depreciation of the permanent way	144	5
Interest and depreciation of the rolling stock	300	0
Fuel (35 lbs. per mile run)	35	15
Oil and grease (3 ½ lbs. per mile run)	8	0
Up-keep of the line	160	15
Staff	248	0
Total	£946	15

The price of transport of one ton of goods is thus $\frac{£946,15s}{30\,000} = 7\frac{1}{2}d.$

BUILDING-CONSTRUCTION.

954 **Grain Silos at Fort William.** (Les silos à grains à Fort William). *Revue Scientifique,* 49e Année, pp. 566. Paris, 4 mai 1912.

Canada
Ontario

The Grand Trunk Pacific Railway Company is making a special depôt at Fort William, Ontario, for the purpose of handling, cleaning and storing grain. It is a question of dealing quickly with the enormous traffic of the districts of the west and north-west of Canada. The grain production, which at present has reached 132 millions of bushels will, in a few years' time, amount to 770 millions.

The depôt can contain 44 millions, and is divided into four distinct sections, each having a capacity of 11 millions.

One part of the building, which can contain 3 850 000 bushels, is already built, and cost nearly £250 000.

The plant consists of cylindrical reservoirs 12 ft. in diameter and 80 ft. high, where the cereals are stored previous to cleaning and picking.

66 other reservoirs 23 ft. in diameter and 95 ft. high receive the cleaned and weighed grain where it awaits dispatch. All the handling of the grain is done automatically, namely unloading of cars, conveyance on travelling belts, loading of hoppers, etc.

In 24 hours, with the present machinery alone, 500 cars can be unloaded; while elevators provided with travelling belts allow of 22 000 bushels per hour being loaded on the steamers for export.

All the buildings are fitted with a special system of pipes for dealing with fire.

The whole machinery is driwen by electricity; the current arrives at a tension of 22 000 volts from a generating station 60 miles away and is transformed to 550 volts for use in the interior of the establishments.

RURAL ECONOMICS.

WARREN, C. F. **Land Values and Land Prices in the East and in the West of the United States.** — *State of New York, Dept. of Agriculture, Circular* No. 18. Albany, 1911. **955**

United States

The development of the western free land in the United States is commonly considered to be the only reason for the decrease in the value of eastern land ; but many other causes contributed their share to the depreciation. Land in the East was too high in the war time and farms were divided into too small areas, so that after the war was over and when the central west was being settled, it was hard for a man on an average size farm in New York to produce enough to make farming pay. Farms in the East are now getting larger as evidenced by vacant houses on land that is not idle. Many persons believe in the little farm, but statistics show that general farms and dairy farms of from 100 to 200 acres are paying much better than smaller farms. The neighbourhood of large cities and other factors contributed also to the general depression in farming and to the lack of confidence that necessarily followed. But conditions have changed now. Free land in the United States is a thing of the past and eastern land that has maintained its value in competition with productive free land will rapidly increase in value, now that such competition is over. In fact there is no reason why this should not be the case. The following table shows a comparison of crop yields in New York and Illinois. For this comparison the writer has selected not the poorest nor even the average western State, but the one usually considered best, and in order to eliminate seasonal variations ten year averages for the last forty years are taken.

Ten-Year Average Yields.

			1896-1905	1886-1895	1876-1885	1866-1875
Corn. .	New York.	bushels	30.3	31.1	30.4	31.6
	Illinois. .	»	34.5	29.0	27.2	29.9
Wheat.	New York.	»	17 5	15.4	15.5	14.1
	Illinois. .	»	13.0	14.3	13.1	11.9
Oats. .	New York.	»	31.4	26.2	30.5	32.2
	Illinois. .	»	32.5	30.4	33.2	30.5
Potatoes	New York.	»	79.0	76.0	101.0	101.0
	Illinois. .	»	80.0	63.0	79.0	76.0
Hay. .	New York.	tons	1.20	1.17	1.16	1.21
	Illinois. .	»	1.36	1.12	1.38	1.36

From this table it will be seen that the crop yields per acre are nearly as good in New York as they are in Illinois. But New York is so favorably situated with respect to markets that the values per acre of the crops are much above those in Illinois. The difference is still greater when compared with Iowa.

The following table shows the changes in the land values in New York, Illinois and Iowa.

Average prices per acre of farm lands.

	1905	1900	1890	1880	1870	1860	1850
New York .	$ 47.17	39.21	44.08	44.41	45.89	38.30	29.00
Illinois. . .	» 74.32	53.84	41.41	31.87	28.45	19.56	7.99
Iowa . . .	» 57.97	43.31	28.13	22.92	20.21	11.91	6.09

The recent rise in the price of western land seems to indicate that the time is near at hand when the production of sheep, horses, butter and lumber will occupy a much larger place as profitable industries in New York.

In order to compare the cost of pasturing in different sections of the United States, reports were asked from the Experiment Stations concerning the average value of pasture land, the number of acres required per cow or equivalent, the months used and the number of months of full feed that the pasture furnished. As a basis for comparisons the amount of money was calculated that must be invested in land in order to furnish full feed for one cow one month. Pasture land ought to pay at least five per cent, if it is to pay interest and the cost of even the minimum attention'. On this basis the cost of a month's pasture in each State was calculated. The following table gives a detailed report of this investigation.

There are many farms for sale in New York at $ 15 per acre. In regions where this land is situated the usual charge for pasturing animals is fifty cents per month. It will be seen that this is about the cheapest pasture land in the United States except that in the south, but the dangers from Texas fever are a serious handicap in that section. The race question also makes it unattractive to northern farmers. The days of free range have practically passed and with their passng the development of the great natural grass lands of New York may be expected.

Cost of Pasture land.

State	Section	Months		Acres per cow	Value per acre	Cost of land per month of pasture
		Used	Full feed			
North Atlantic States					$	$
Maine	Waste	—	4.0	17.5	6.00	26.00
»	Tillable	4.0	3.0	5.0	15.00	25.00
New Hampshire. . .		5.0	4.0	3.0	18.00	14.00
» . . .		6.0	4.5	4.0	13.00	12.00
Massachusetts. . . .	Eastern	6.0	4.5	8.0	6.00	11.00
»	Western	5.5	4.5	8.0	5.00	9.00
Connecticut.	Better land	5.0	4.0	1.0	50.00	13.00
»	Poorer land	5.0	3.0	2.0	20.00	13.00
Rhode Island. . . .		6.0	4.5	3.5	27.00	21.00
New Jersey.		6.0	4.5	2.5	50.00	28.00
Pennsylvania	Southwest	6.0	4.5	2.5	50.00	28.00
	Average	5.5	4.1			18.00
		Cost of pasture per month				0.90
Corn Belt						
Illinois	Central	6-7	6.0	2.0	150.00	50.00
»	»	6.0	6.0	1.5	200.00	50.00
»	Southern	7-8	7.0	5.0	40.00	29.00
Iowa	Central	6.0	5.5	1.5	100.00	27.00
»	Northern two-thirds	5.5	5.5	1.5	75.00	21.00
»	Southern one-third	6.0	6.0	2.0	60.00	20.00
Kansas	Eastern	7-8	7.0	2.0	55.00	16.00
Nebraska	»	7-8	6.0	2.0	55.00	18.00
»	»	—	6.0	2.0	60.00	20.00
Missouri	Corn belt	7.0	6.0	2.0	75.00	25.00
»	Northern	6.0	5.0	3.0	43.00	26.00
	Average	6.6	6.0			27.00
		Cost of pasture per month				1.35
Middle West outside Main Corn Belt						
Michigan	Best land	—	5.0	1.0	100.00	20.00
Ohio	Southeastern	6.0	4.0	2.0	50.00	25.00
Wisconsin.	Northern	5.5	4.5	2.5	25.00	14.00
»	Middle	6.0	5.0	1.75	75.00	26.00
Minnesota.	Northern one-third	4.5	3.5	2.0	28.00	16.00
»	Northwestern	5.0	4.5	2.0	33.00	15.00

Cost of Pasture land (cont.).

State	Section	Months		Acres per cow	Value per acre	Cost of land per month of pasture
		Used	Full feed			
					$	$
Minnesota.	Southern two thirds	6.0	4.5	2.0	43.00	19.00
»	Southwestern	5.5	5.0	1 ⅓	55.00	15.00
»	Southeast in rotation	6.0	5.5	1 ¼	70.00	16.00
North Dakota. . . .	Eastern	5.0	4.0	3.0	30.00	15,00
»	Red River Valley	5.5	4.5	2.0	50.00	22.00
Kansas	Central	—	5.0	2.5	20.00	10.00
»	»	—	4.0	3.5	20.00	18.00
Kentucky	Western	7.0	5.0	4.5	35.00	32.00
»	»	6.0	4.0	3.5	50.00	44.00
Missouri	Poorer sections	6.7	6.0	3.5	33.00	19.00
»	Southern	8.0	7.0	11.5	17.00	28.00
	Average	5.9	4.8			21.00
		Cost of pasture per month				1.05
Blue Grass Region						
Kentucky.	Blue Grass	8.9	6.7	2.8	100.00	43.00
»	»	8.0	6.0	2.5	100.00	42.00
Tennessee.	»	10.0	8.0	3.0	50.00	19.00
Virginia	»	8.0	7.0	3.0	50.00	21.00
	Average	8.6	6.9			31.00
		Cost of pasture per month				1.55
Southern States						
Tennessee.	Western	8.9	7.0	2.0	25.00	7.00
North Carolina . . .	Mountains	7.0	7.0	2.0	20.00	6.00
» . . .	Coastal Plain	5.0	4.0	7.0	5.00	9.00
» . . .	Piedmont	6.0	5.0	2 ¾	18.00	10.00
South Carolina . . .	»	8.0	5.0	2.0	35.00	14.00
Georgia.	Northern	8.9	6.7	2.0	18.00	6.00
»	»	7.0	6.0	4.0	7.00	5.00
»	Southern	10.0	9.0	3.5	8.00	3.00
»	»	7.5	6.5	4.0	7.00	4.00
Florida	»	10-11	10.5	2.0	8.00	2.00
»	Northern	9.0	9.0	10.0	4.00	4.00
Arkansas	SouthOzarks (bottoms)	12.0	9.0	1.5	20.00	3.00
»	Ozarks (good land)	10.0	7.0	1.0	40.00	6.00
Mississippi	Northeastern	8.0	8.0	4.0	13.00	7.00
»	Central and Southern	8.0	8.0	6.0	9.00	7.00
Alabama	Western and Northern	8.10	8.10	2.0	12.00	3.00

Cost of Pasture land (cont.).

State	Section	Months		Acres per cow	Value per acre	Cost of land per month of pasture
		Used	Full feed			
					$	$
Alabama	Eastern	7.0	7.0	4.0	10.00	6.00
Louisiana.	Northern	8.0	6.5	2.5	13.00	5.00
»	Southern	9.0	8.0	1.0	30.00	4.00
	Average	8.3	7.2			6.00
		Cost of pasture per month				0.30
Arid Regions						
North Dakota. . . .	Western	8.0	6.5	10.0	10.00	15,00
Nebraska.	»	9.0	6.0	10.0	8.00	13,00
»	»	7.0	6.5	25.0	5.00	19.00
Kansas.	»	9-12	9.0	9.0	13.00	13.00
Texas.	Southwestern	—	12.0	10.0	7.00	6.00
»	Northwestern	—	12.0	8.0	10.00	7.00
Montana	Open range	6-7	5.0	15.0	5.00	15.00
New Mexico.	6500 feet	6.0	6.0	17.5	0.88	3.00
»	Below 6500 feet	12.0	12.0	30.0	0.88	2.00
Arizona.	Free range	12.0	12.0	many	0.00	0.00
Oregon	Eastern	8-12	8.0	7.0	15.00	13.00
California.		—	10.0	10.0	10.00	10.00
	Average	9.0	9.0			10.00
		Cost of pasture per month				0.50
Western moist and irrigated land						
Montana	Irrigated	6.0	4.5	1/2	75.00	8.00
Idaho.	Northern	6.0	5.0	1/2	58.00	6.00
»	Irrigated	7.0	6.0	1/3	113.00	6.00
»	»	5.0	5.0	2.0	50.00	20.00
Utah	Utah and South Idaho	7.0	5.5	1.5	50.00	14.00
»	Lowland	7.0	6.0	1.0	20.00	3.00
»	Irrigated	6.0	5.0	1.0	88.00	18.00
Arizona.	Alfalfa (irrigated)	12.0	12.0	0.88	188.00	14.00
Nevada.	River bottoms	—	12.0	4.0	55.00	18.00
»	Irrigated grass	—	6.0	2/3	100.00	11.00
»	» alfalfa	—	6.0	1/2	150.00	13.00
Washington.	Near cities	7.0	7.0	2/3	250.00	24.00
»	Alfalfa	7.0	7.0	5-12	150.00	9.00
Oregon	Coast	10.0	9.0	2.0	88.00	20.00
	Average	7.3	6.9			13.00
		Cost of pasture per month				0.65

956 **Subdivision of Estates in the Ferrara District and Formation of Farms.** (Per l'appoderamento ed il frazionamento dei fondi nel Ferrarese). *Pubblicazione del Comizio Agrario di Ferrara,* 1 fasc., pp. 1-50 + 10 tavole. Ferrara, 1911.

Italy: Ferrara

The Agricultural Association of Ferrara, with the object of facilitating the subdivision of estates and of intensifying the farming of the reclaimed lands, organised a competition with prizes for the best projects of complete farm buildings, including dwelling-houses, stables, barns and sheds for the produce, machinery and implements.

The projects were to be drawn up in conformity with the conditions obtaining in the Ferrarese *old lands,* that is those not recently reclaimed, and with those of the newly reclaimed lands.

The typical Ferrarese farm may be considered to consist of the following:

	Acres
Dwelling house, threshing-floor, kitchen garden, stabling and nursery	2 3/4
Meadow and pasture	13 ½
Arable land, with rows of trees and vines, divided into two parts; one under wheat . .	21
The other under spring crops, hemp and some maize and beans	21
About 16 % of the arable land occupied by headlands, ditches etc.	6 ½
Total . .	64 3/4

For working such a farm two families are considered necessary: the stock and ploughman's composed of ten or twelve members, including children, that is the head ploughman and two helps with their wives and boys to look after the cattle whilst grazing; and the farm labourer's consisting of five or six members, that is two men with their wives and children. The draught stock required averages 10 head ranging from three years to upwards of six, besides 6 head of breeding cattle, altogether 16 head.

The buildings consist of a dwelling house for the ploughman, a hay barn with well and drinking trough, a small building containing an oven for baking, a fowl house and a pigstye, and another dwelling house for the farm labourers situated in another part of the farm. The total value of these buildings is about £280.

The competition included consequently the following classes of farm buildings:

1st class. Buildings for a Ferrarese farm of the area of 60 to 75 acres managed on the above mentioned system, namely with the two families.

2nd class. Buildings for an existing farm divided into smaller holdings of 32 to 37 acres and worked on the half share system, or directly by the owner, or let.

3rd. class. Buildings for recently reclaimed lands divided into farms of about 75 acres.

Sig. Tabarroni, Civil Engineer, the prize winner, presented designs and estimates for all the classes included in the programme.

The group of buildings for Class I. (farms of about 60 to 75 acres) included several types. Type *A*, the cost of which is about £555 or £7, 8*s*. to £7, 14*s*. per acre; type *B* entails an expense of £6, 8*s*. to £6, 11*s*. per acre and provides for the two families and for 18 to 20 head of stock. Type *B2* costs £5, 12*s*. to £6, 15*s*. per acre, and type *C* £4, 9*s*. to £5,12*s*. The first is a house for one family and the second a house for two families with stabling, of the type usual in the reclaimed lands, for 18 head of cattle.

For Class II (farms of 32 to 37 acres) three types were designed: type *A* costing £11, 5*s*. to £12,7*s*. per acre, type *B* £11, 14*s*. to £12, 17*s*. per acre; and Variant *B* £10, 2*s*. to £11, 11*s*. per acre. They provide for one family and 12 head of cattle; in type *A* the house and the stabling are in the same building, in type *B* they are separated; in the variant *B* the house is somewhat cheaper.

For Class III (reclaimed lands, farms of 75 acres) the type proposed entails an outlay of £5 per acre and offers accommodation for one or two families, 30 head of cattle and 4 horses.

Sig. Tabarroni's report furnishes ample information on these various types. The estimates with the original designs drawn up on a scale of 1 : 100 are deposited at the Ferrara Agricultural Association where they may be seen by anyone who wishes to do so.

SERPIERI, A. **Conditions of Silkworm Breeding on the Farming Out System in the Upper Milanese Province.** (Patti colonici e bachicoltura nell'Alto Milanese). — *Atti della Commissione d'inchiesta, per le industrie bacologica e serica, del Ministero d'Agricoltura, Industria e Commercio,* Volumi I-IV: Vol. IV, *Economia dell'Industria,* pp. 624-655. Roma, 1910-1912. **957**

The descriptive part of this memorandum, in which are set out the conditions of actual fact, is based on a study of the conditions **Italy** of contract applied on 114 estates and 206 so-called « colonies », scattered in the districts of Gallarate, Monza, Abbiategrasso and Milan, in the last two named of which it is limited to the zone where small rent in kind prevails, and attached thereto a silkworm-breeding " colony " on the system of a division of proceeds between the landlord and the peasant or " colono ".

In this region we find:

1. Small properties, now very much on the increase, especially in certain zones.

2. Medium and large properties, carried on in small " colonies ", each entrusted to one family of peasants, where the system prevails of letting for small rents payable partly in kind and partly in money, together with some occurrence of " colonies " on the basis of a division of produce.

3. The form, as yet not so widespread but largely increasing to-day, of small rentings in money for a definite time, with the disappearance of every occurrence of " colonies " on the divided produce basis. The normal contractual bases regulating the rearing of silkworms on the " colony " system with small rents are as follows:

It is the duty of the " colono " to breed the eggs which the landowner entrusts to him proportionally to the quantity of leaves of the " colony " and the rooms available, and also the working capacity of the family; the breeder however cannot claim the right to breed the worms, because the mulberry leaf is declared to be the property of the landlord, who could even sell it or make use of it otherwise than by allotting it for use on this system. The landlord has the right of supervising the breeding. The following are provided exclusively by the peasant rearer: The supply of the rooms and implements (tables, supports, bundles of twigs, paper), heating and lighting the rearing rooms, the whole of the labour needed for rearing and gathering the leaf, and the transport and the delivery of the cocoons to the place indicated by the landlord. The landlord advances in their entirety, and debits to the extent of one half in the book of the " colono ", the costs of purchase of eggs, hatching the latter, disinfecting the rooms and implements, the supervision of the rearing and, if necessary, purchase of leaf, when that of the " colony " runs short. The stripping of the purchased leaf is however often incumbent on the rearer. The produce is handed over entirely, including defective cocoons, to the landlord, who attends to the sale and collecting the proceeds; the rearer, after deducting the costs of sale (intermediaries), is credited as to one half in the book of the " colono ". One half of the proceeds from the defective cocoons is often not credited, but handed at once to the rearer. As compared with these conditions, the many variations encountered show two principal tendencies:

a) The tendency to lighten the burdens imposed on the rearer (colono).

b) That of fixing the burdens of the rearer at a settled sum debited to him in the book, and proportionally to the amount of eggs or the quantity of product obtained. It should be observed however that all these variations from the normal conditions generally do not greatly affect the final income of the rearer, as they involve differences of relatively small amount.

As regards the contract conditions relating to the mulberry leaf, it should be noted that there is a growing tendency for the landlord to undertake all the expenses and work necessary for the mulberry from the time of its planting until the stripping of the leaves is begun, that is to say wile the trees are growing, while the whole of the labour for the ordinary cultivation is supplied by the "colono" under the direction of the landlord and in the manner and times fixed by the latter.

Great diversity of conditions was found as regards the control of the *Diaspis*. Between the two extreme cases, which are likewise found in large numbers, in which the landlord respectively carries on treatment at his expense, or does not concern himself with it at all, there are many intermediate systems. In the latter, the most frequent system is for the rearer to supply the labour and the landlord the necessary materials.

The landlords generally attach enormous importance to the silkworm breeding; for them the success or failure of the agricultural year is bound up with the results of the rearing. No full explanation of this could be found by merely considering the financial balance sheet of the estate. In the latter it would in fact generally appear that the amount representing the landlord's half of the cocoons is generally considerably less than his other revenues for rents of land, houses and implements.

The importance of the revenue from the cocoons in the balance sheet of the peasant is comparatively much smaller than for the landlord. Out of 142 peasant accounts studied in the present enquiry there were only found three cases, really exceptional, in which the income of the "colono" from silkworm-rearing exceeded his remaining income; in 119 cases the former is less than one half of the latter; in the remaining 20 cases the former is less than the latter, but nevertheless exceeds one half.

Passing on to consider the assets and liabilities of the economic balance sheet in regard to the rearing of one ounce (30 gr.) of eggs, the author gives us the following particulars:

Taking an average product of 50 kg. (110 lbs.) valued net of all expenses of sale, supervision and conveyance to the spinning mill — which expenses are regarded as being borne, as is usually the case, one half each by the landlord and the "colono" — at L. 3.30 per kg., there are obtained L. 165 (£6,10*s.*) to be divided in halves between the parties. The expenses of producing one ounce of 30 gr. are as follows:

Eggs, 30 gr.	L. 12.—	9*s.* 6*d.*
Incubation and disinfection .	» 1.50	1*s.* 2*d.*
Price for use of the mats (1)	» 10.—	7*s.* 11*d.*
Paper (2)	» 1.50	1*s.* 2*d.*
Fire wood (3)	» 5.—	4*s.* 0*d.*
Bunches of twigs (4)	» 3.—	2*s.* 4*d.*
Total . . .	L. 33.—	26*s.* 1*d.*

The distribution of these expenses is calculated as follows in the way in which it usually occurs: trays, fire-wood and bunches of twigs to be found by the "colono"; eggs, incubation and disinfection, paper, divided between the landlord and "colono" equally. This makes L. 25.50 (£ 1) payable by the "colono"; L. 7.50 (6*s.*) payable by the landlord. Dividing the returns, we have: L. 57 (£ 2,5*s.*) net of expenses falling to the "colono"; L. 75 (nearly £ 3) going to the landlord.

Assuming a consumption of 12 qls. (24 cwt.) of leaf per ounce, the price realised by the landlord for his leaf is a little less than 6 lire per quintal (2*s.* 4*d.* cwt.).

In the classical treatise of Verson and Quajat, the following figures are given for the labour required for rearing one ounce of eggs, which figures the authors state to be deducted from ten-year averages of actual rearing.

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(1) 22 mats. Purchase price L. 50. Annual charge for use, including interest and redemption, 20 %.

(2) About 6.50 kg. or, assuming the weight of 100 gr. per sheet, 65 sheets — 12 ½ "quinterni". Purchase price about L. 0.21 per kg. or L. 0.11 per "quinterno".

(3) This item varies very much from year to year: 2 qls. at L. 2.50.

(4) Taken at about 50 kg. at L. 6 per quintal.

1st stage:	1 person	for 5 days	5 days
2nd »	1 »	5 »	5 »
3rd »	1 »	6 »	6 »
4th »	2 »	7 »	14 »
4th »	4 »	7 »	28 »
Collecting cocoons	6 »	1 »	6 »
			64 days

The author observes that these figures were fairly high, but that even lowering considerably the number of 64 days given by Vernon, and assuming that the 12 quintals of leaf required for one ounce of eggs demand about 5 days of work for the pruning and clipping of the mulberry trees, etc., the revenue of L. 57 (£ 2,5s.) of the " colono " certainly does not represent much more than 1 lira (9 ½ *d*.) per normal day of work.

In the 159 balance sheets studied, the following results were obtained :

Revenue of " colono " per ounce of eggs	" Colonies "
	—
from L. 30 (£1, 3*s* 10*d*) to L. 40	2
» » 40 (£1, 11*s* 9*d*) » 50	6
» » 50 (£1, 19*s* 8*d*) » 60	27
» » 60 (£2, 7*s* 7*d*) » 70	22
» » 70 (£2, 15*s* 7*d*) » 80	47
» » 80 (£3, 3*s* 6*d*) » 90	34
» » 90 (£3, 11*s* 5*d*) » 100	16
» » 100 (£3, 19*s* 4*d*) » 110	5
	159

It should be noted that these incomes include the price for use of the mats belonging to the " colono " and the material supplied by him and brought from the estate (twigs and firewood). Thus these figures represent something more than the mere remuneration for the rearer's work, and as a whole confirm, considered in conjunction with the divergences, that general average which had been reached by means of calculation. The divergences are chiefly due of course to the different quantities of product per ounce; the cases of exceptionally low yield correspond almost always to those in which leaf is purchased every year or nearly so.

In the propaganda which is on foot for the extension of mulberry-growing and silkworm-rearing in Italy, the Author thinks it advisable to direct the attention of agriculturists to the necessity, taking more and more definite form, of allowing a somewhat larger share than in the past for the remuneration of labour, because in the future especially, silkworm rearing will have difficulty in finding the necessary labour if it does not secure in return for the labour of rearing alone (including the stripping of mulberry trees) a remuneration of about 70 lire (£2,15*s*). To obtain this result, even though in the future average prices not lower than those during the past decade may be anticipated, it is necessary to obtain fairly high unit productions, exceeding those secured on the average in the district under consideration, about 50 kg. per 12 qls. of leaf consumed, or to reduce the cost of the leaf.

Average productions in excess of 50 kg. per ounce are however not so easily obtained as stated by some.

The author is therefore of opinion that landlords should not be encouraged to plant mulberry trees, except where the conditions are not merely suitable for obtaining high unit yields from silkworm rearing (owing to quality of labour, rearing rooms, etc.) but where likewise the not very high price of the leaf (about L. 5 per quintal, 2*s*. per cwt.) makes mulberry-growing desirable as compared with other crops that is to say, mulberry-growing carried out at the cost of the landlord and not conducted at the expense, even in part, of that allowance of L. 70 which was assumed to be reserved to labour for the rearing alone.

958 BROWN, W. G. **Sheep-grazing Farms in Queensland.** — *The Queensland Agricultural Journal*, Vol. XXVIII, Part 2. Brisbane, February 1912.

Australia: Queensland

The writer, State sheep and wool expert, studies in this paper the following question: How much capital is required to take up unimproved country, fence, stock and put it in working condition?

There are, of course, he says, a good many classes of country to be considered, and the rents on these range from 3/4 *d.* per acre, to as high as 4*d.* per acre, the price, of course, being in proportion to its carrying capacity in a series of years, as determined by the commissioners and the land boards. Approximately, the cost of improvement is the same on all classes of land, so that the item of difference in rent is the only one which affects the account.

The writer considers first the case of a man who has sufficient capital to improve his country fully within a year or two of the issue of the license to occupy, supposing that all water supply is to be provided by the incoming lessee; and he makes the following estimate for the improvement of a selection of 20 000 acres.

Approximate estimate of improving a selection of 20 000 acres.

	£.	s.	d.	£.	s.	d.
First year's rent: 20 000 acres at 1*d.* (say)				83	6	8
One-fifth survey fee (£ 60)				12	0	0
Fencing: Boundary fence netted against rabbits, 23 miles, at £ 65 per mile	1 495	0	0			
Less half-share of 18 miles done by neighbours	585	0	0			
				910	0	0
Subdivision of 10 miles. at £ 30 (6-wire fence)				300	0	0
Sheep-yard to hold and work 2 000 sheep				85	0	0
Shearing-shed for 5 shearers				10	0	0
Woolroom for same (galvanised iron)				45	0	0
Woolpress £ 20; dray £ 15				35	0	0
Harness and tools				50	0	0
Horses:						
3 draughts at £ 25	75	0	0			
5 saddle at £ 8	40	0	0			
				115	0	0
Wages and food for 1 man				100	0	0
3 sub-artesian wells (200 feet each) at £ 1 per foot				600	0	0
2 windmills, with troughing and tanks £ 120 each				240	0	0
House and outbuildings				300	0	0
Sheep at 4 acres to 1 sheep:						
4 000 ewes at 7*s.* 6*d*, off shears				1 500	0	0
120 rams (3 %) at 80*s.*				480	0	0
Say £ 5 000 . . . £				4 855	6	8

The estimate given above is as close as the writer can give after a good deal of experience and close inquiry. Of course, almost every item is only approximate, as the prices for labour carriage and stock vary in the different districts.

There is every indication that prices for wool and stock will remain at least as they are for several years, as the consumption of wool appears to have overtaken the demand, and wethers are relatively scarce. The following estimate is based on average prices for stock and wool.

Returns to be expected on a capital of £ 5 000.

	£.	s.	d.
The wool off 4 000 ewes, 6 lb. 12 oz. each, at 8*d* per lb.	812	10	0
80 per cent of lambs on 4 000 ewes, 3 200 at 3 *s.* per head	480	0	0
£	1 292	10	0

Expenditure.

	£.	s.	d.	£.	s.	d.
Shearing 4 000 ewes at 6*d* per head	100	0	0			
Carriage of wool to market at 5*d* per head.	83	6	8			
Extra labour and sundries.	166	13	4			
				350	0	0
Approximate return . . . £				942	10	0

This means nearly 19 per cent, a return which should leave an ample margin for contingencies. The writer states that he has been liberal concerning expenses and correspondingly conservative in estimating returns. In shearing for instance, if the owner shears his own sheep the work may be done at a cheaper rate, especially if there is home labour to do the necessary mustering, wool-rolling, etc.

959 WATERSTRADT, F. **Statistical Investigations into the Utilization of Fodder Crops and of Capital by means of Cattle (Nutzvieh) in Various Districts in Germany.** (Statistische Untersuchungen über Futterbau- und Kapital-Ausnutzung durch Nutzviehhaltung in verschiedenen Gebieten Deutschlands). — *Archiv für exakte Wirtschaftsforschung*, Band IV, Heft I, pp. 88-128. Jena, 1912.

Germany

In order to estimate correctly the value of these investigations it is necessary as the writer remarks, to realize first of all that, though the amount of material which has been collected is in itself vast, it is, nevertheless, relatively small in comparison with the problem under discussion and touches only on the most salient points. Taken as a whole, however, it shows from certain points of view sufficient agreement to justify one in drawing some conclusions, which have a real practical value as they are the result of the study of well-ascertained facts.

This material is, for the most part, collected in the "Arbeiten" (1) of the Deutsche Landwirtschafts-Gesellschaft, which form part of the enquiry respecting the economic conditions of farming in Germany (Betriebsverhältnisse der Deutschen Landwirtschaft); and from "Buchführungs Ergebnisse aus der Buchstelle der D. L. G.," by Langenbeck of the Book-keeping Office of the above Society.

The accounts of 443 separate farms are fully discussed and the results were elaborated, according to Thünen's system, in the order of a progressive decrease of the income derived from cattle — per zone as well as per groups in the single zones (deducting, of course, from the income the purchase price of the cattle) — in order to see how far it was possible to determine by such means the effect of cattle on the total receipts of the farm and upon the factors of production (Betriebsmittel).

Table I gives the general averages for the separate districts, arranged in decreasing order according to the receipts from cattle per 100 hectares of cultivated area:

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(1) The following is a list of these papers:

No. 1	Niederrhein	Leaflet	185	elaborated by	W. Dix
» 2	Wiesbaden	»	148	» »	J. Fülberth
» 3	Nördl. Sachsen.	»	192	» »	B. Schöne
» 4	Wetterau	»	133	» »	R. Franz
» 5	Arnsberg	»	164	» »	W. Golte
» 6	Dithmarschen	»	188	» »	P. Hinrichs
» 7	Börde	»	130	» »	P. Gutknecht
» 8	Ostholstein	»	187	» »	W. van der Smissen
» 9	Eifel	»	169	» »	L. Schmitz
» 10	Witzenhausen	»	186	» »	R. Klein
» 11	Eichsfeld	»	183	» »	Frhr. von Vintzingerode
» 12	Schlesien	in the press			
» 13	Märkische Brennereiwirtschaften		118	» »	F. Langenbeck.

TABLE I. — *General averages per 247 acres (100 hectares).*

	N° of farms	Income from cattle	Number of cattle	Value of live-stock	Percentage under fodder crops	Cost of purchase of food-stuffs	Net income (Reinertrag)	Area in acres	Gross income (Rohertrag)	Percentage of gross income from cattle	Net income from cattle
		£ s.		£. s.		£. s.	£. s.		£. s.		£. s.
1. Niederrhein	81	1 625 8	105.3	2 245 8	56.7	597 14	750 9	185	2 429 8	67	501 16
2. Wiesbaden	15	1 011 7	72	1 696 6	29.3	286 4	252 19	115	2 235 9	45.4	114 12
3. Nördl. Sachsen . . .	12	972 13	91.1	1 706 5	21.6	360 2	711 15	334	2 407 2	40.4	288 11
4. Wetterau	34	968 14	65.1	1 843 13	22.9	302 1	841 4	65	2 352 11	41.2	345 7
5. Arnsberg	25	933 0	55.1	1 041 12	71.8	205 17	440 19	148	1 883 16	49.7	219 8
6. Dithmarschen	13	838 5	86.4	1 821 16	72.3	150 16	613 14	167	1 595 3	52.5	322 18
7. Prov. Sachsen, Börde	29	545 2	50.3	1 058 19	11.5	379 19	815 18	1 004	3 199 14	17	139 3
8. Ostholstein	14	532 4	54.5	1 495 19	44.1	225 4	335 6	1 044	1 247 19	42.6	143 14
9. Eifel	31	449 17	50.8	1 246 9	41.1	58 11	183 0	87	1 047 1	43	73 14
10, Witzenhausen	10	462 5	45	995 9	37.5	119 11	256 9	232	1 197 7	38.7	99 16
11. Eichsfeld	18	435 0	57	1 006 18	22.9	120 11	76 8	137	936 9	46.4	35 9
12. Schlesien	81	338 5	28.5	912 13	24.6	191 19	319 18	834	1 449 16	23.4	74 17
13. Buchstelle D. L. G. .	77	307 10	32.4	716 4	28.1	148 16	241 1	—	1 316 8	23.4	56 8
14. Märkische Brennerei .	53	252 19	27.8	704 18	28.1	104 3	201 8	1 282	1 104 12	22.9	46 3

TABLE II.

	Per head of cattle				Per 100 Mk of income from cattle				
	Income from cattle	Area under fodder-crops	Net income	Cost of purchasing food stuffs	Value of live-stock	Area under fodder-crops	No. of head of cattle	Cost of purchasing food stuffs	Net income
	£. s.	acres	£. s. d.	£. s. d.	£. s.	acres		£. s. d.	£. s. d.
Niederrhein.	15 10	1.33	4 14 0	5 12 7	6 15	0.43	0.32	1 15 11	1 10 2
Wiesbaden	14 1	1.01	1 11 7	3 18 6	8 5	0.36	0.35	1 7 8	0 10 2
Nördl. Sachsen . . .	10 13	0.59	3 2 7	3 18 0	8 11	0.27	0.46	1 16 4	1 9 1
Wetterau.	14 18	0.86	5 4 9	4 11 9	9 6	0.29	0.33	1 10 7	1 14 11
Arnsberg.	16 18	3.24	3 18 7	3 13 9	5 10	0.94	0.29	1 1 8	1 3 0
Dithmarschen. . . .	9 13	2.07	3 13 10	1 14 6	10 12	1.06	0.51	0 17 9	1 17 8
Börde.	10 16	0.57	2 14 8	7 8 10	9 12	0.26	0.46	3 8 10	1 5 2
Ostholstein	9 15	2.00	2 12 0	4 1 7	13 16	1.02	0.51	2 1 7	1 6 6
Eifel.	8 18	2.00	1 10 8	1 2 9	13 11	1.12	0.56	0 12 10	0 17 1
Witzenhausen	10 5	2.05	3 2 9	2 12 6	10 10	1.00	0.48	1 5 4	1 1 2
Eichsfeld	7 13	0.99	0 12 4	2 1 9	11 7	0.65	0.65	1 7 1	0 8 0
Schlesien	11 17	2.12	2 12 3	6 13 2	13 4	0.89	0.42	2 15 7	1 1 10
Buchstelle D. L. G. . .	9 10	2.15	1 14 8	4 10 8	11 8	1.12	0.52	2 7 5	0 18 1
Märk. Brennerei. . .	9 3	2.49	1 13 1	3 13 11	14 13	1.37	0.55	2 0 4	0 18 0

In Table II the figures are per head of cattle and per 100 Marks (£4, 19*s* 2*d*.)

The differences in the utilization of the capital invested in live-stock and that invested in fodder-crops are shown in the following table:

	Per 100 Mk (£ 4 19s 2d) invested in live-stock on the farm			Per 1 ha. (2.47 acres) area under fodder crops				
	Value of cattle	Income from cattle	Area under fodder crops	Value of live-stock	Fodder crops	Net income from cattle	Total income from cattle	Head of cattle
	£ *s*. *d*.	£ *s*. *d*.	acres	£ *s*.	£ *s*.	£ *s*.	£ *s*.	
Niederrhein	3 10 9	1 1 10	0.30	39 11	10 11	8 18	28 13	1.86
Wiesbaden	2 18 4	0 6 8	0.21	58 1	9 15	3 18	34 10	2.46
Nördl. Sachsen	2 15 10	0 16 7	0.16	78 17	16 13	13 7	45 1	4.22
Wetterau	2 11 5	0 18 4	0.15	80 7	13 4	15 2	42 6	2.84
Arnsberg	4 6 5	1 0 9	0.84	14 11	4 4	3 2	13 0	0.77
Dithmarschen	2 5 2	0 17 5	0.49	25 4	2 2	4 9	11 12	1.20
Börde	4 11 2	0 12 10	0.13	92 5	32 15	12 3	47 8	4.38
Ostholstein	1 14 9	0 9 5	0.36	33 19	5 2	3 5	12 1	1.24
Eifel	1 15 4	0 6 2	0.41	30 7	1 9	1 19	10 19	1.24
Witzenhausen	2 5 5	0 9 9	0.46	26 11	3 3	2 14	12 7	1.20
Eichsfeld	2 2 4	0 3 5	0.28	44 0	5 5	1 11	19 0	2.49
Schlesien	1 16 4	0 8 2	0.33	37 2	7 16	3 2	13 15	1.16
Buchstelle D. L. G. . . .	2 2 2	0 7 10	0.48	25 10	5 6	2 1	10 19	1.16
Märk. Brennerei.	1 12 11	0 6 1	0.46	26 18	3 14	1 13	9 1	0.99

From an examination of the general averages of the different districts which we have given, it appears very clearly that there are great differences in the utilization of the different factors of production of the farm which affect the final economic results with regard to the productive cattle.

These differences allow it to be supposed that, especially in E. Prussia, both from the technical and the economic point of view, it might be possible and perhaps also necessary, to increase the importance of cattle on the farm. This hypothesis is strengthened by the relation which exists between the area of ploughed land and its production.

The writer further arranges the farms of the different districts according to Thünen's system. It suffices to say that, according to the conclusions of the writer himself, it appears fairly clear that there is a relation between the income produced by cattle and the net and gross income of the farm. From the consideration of these relations, it appears clear that the utilization of land under fodder-crops and of the capital expended upon the live-stock of the estate depends largely upon the higher or lower figures which represent these receipts.

These facts, the writer says, lead us to believe that, as has already been mentioned, an increase in the number of cattle would be of advantage to the farm, even in E. Prussia.

The researches with regard to the effect of the size of the estate and of its relative production on the utilization of the factors of production and turning them to best advantage (in which the data elaborated by the Book-keeping sections of the D. L. G. which refer to the " Märkische Brennereiwirtschaften " have been made use of) have confirmed the results hitherto obtained. We find in small estates, as a rule, not only more cattle, but a better utilization of the factors of production.

Nevertheless, if with the increased size of the estate the difficulties of increasing the number of cattle become greater, yet the criteria for the valuation of the utilization of fodder-crops and of capital lead to the serious contemplation of the possibility of adopting this measure.

The results of the investigations into the size of the farm and the total live-stock cannot be interpreted in the same way. They show that especially in Silesia, the total number of cattle kept on a farm only affords a guarantee of profit and income if the receipts as a whole, and for each head of cattle in particular, are sufficient to exclude too large an outlay for the purchase of feeding-stuffs. It is also necessary to counteract the above-mentioned obstructive effect of large farms upon the increase of cattle by means of rational management and constant guidance and control. The examination of the given data shows the importance of these conclusions, even from the practical side.

Nothing has been found to support the saying that cattle are a necessary evil on the farm, but they should be considered like arable cultivation as a factor tending to increase the net income, provided that the utilization of the means of production is effected by reasonable organization and guidance.

The conditions for this are that each head of cattle should bring in sufficient return at not too high an expenditure, and that the area under fodder-crops should be intensively cultivated, so that the factors of production employed should be utilized to their fullest extent.

Given these conditions, also in the most favourable productive conditions of the estate, it is possible, as a rule, by means of technical and economic adaptations, to increase still further the number of cattle and thus to increase the net income of the estate. Unsuitable natural conditions in most cases constitute a hindrance to increase of the number of cattle, but there is no doubt that also in East Prussia, the tendency in the organization of the farm is the same as that which has given an impetus to the development of the farms of West Prussia.

Only thus, according to the writer, can agriculture fulfil its mission in national economy, a mission which consists in continually supplying the ever-increasing population with food, and thus only is it possible to guard against foot-and-mouth disease imported from other countries.

A more detailed study of these problems along the lines indicated, would probably be successful, and is necessary to render the following points clearer than the writer has been able to do:

The effect that the productive conditions (especially the price of milk), have upon the number of cattle on the farm taking into account its relative position, and the consequent utilization of the factors of production.

The effect of natural conditions, especially the greater or less capability of the soil to produce abundant green-crops, that of natural pasturage, etc., and the resulting hindrances to the increase in the number of cattle.

Investigations, as exact as possible, into the question of the connection between intensity of fodder-cropping, the utilization of the factors of production by cattle and the possibility of increasing the total returns from the estate.

The use and utilization of the food-stuffs produced under more intensive culture of the green crops area.

The possibility of using the different food-stuffs produced on the farm for different kinds of stock.

The data for investigations of this kind can only be furnished by Book-keeping Institutes; hence the necessity of founding such, both in the general interest of agriculture and for the scientific solution of problems of which only the most important have been touched on here. The writer does not pretend to have done more than give a preliminary contribution.

The same conclusions have been reached from the elaboration of the material collected by Langenbeck. Laur came to similar conclusions from the elaboration of the material of the Swiss Peasants' Secretariat.

960 LANGENBECK, E. **Some Results of the Agricultural Book-keeping Bureau of the German Agricultural Society**. (Buchführungsergebnisse aus der Buchstelle der D. L. G.). — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft,* Heft 180, pp. 1-64+VIII Tafeln u. 7 Tabellen. Berlin, 1911.

Germany

This work is the result of the examination of the books of 78 farms situated as follows:

6 in West Prussia and Pomerania;
16 in the province of Posen;
16 in Silesia;
18 in Brandenburg;
7 in Mecklemburg;
10 in the province and Kingdom of Saxony;
5 in other States.

To give an exact idea of the method followed in preparing this material for study, the averages of a period of five years in six groups of farms composed as follows, are given.

Group I. — 10 farms in which 25 % of the arable area is devoted to forage crops.

Group II. — 15 farms in which 60 % of the arable area is devoted to cereals.

Group III. — 22 farms with extensive cultivation of potatoes for distillery.

Group IV. — 13 farms with extensive cultivation of sugar beets.

Group V. — 12 farms yielding a high net revenue.

Group VI. — 12 farms yielding a low net revenue, or worked at a loss.

As a complement to table I, table II shows the average daily cost of a draught horse or draught ox, of a normal head of breeding stock, of 100 sheep and of 10 pigs, with their maxima and minima, according to the results obtained by the examination of the account books of the various groups of farms.

Table III shows the amount of labour per acre of cultivated soil in the 4 groups of farms, the total number of days work of the draught animals, and the total cash outlay per acre of cultivated soil as well as the distribution of the area in the various groups.

With these statistics, the author investigates some questions of general interest, among which the effect of the distance of the markets on the organisation and on the production of the farms; this is undoubtedly great, while its effect on the economic results (net income) does not appear except as the direct consequence of the organisation which has been adopted.

Thus, with the increase of the distance the absolute net returns per unit of surface diminish, but as farms adopt those forms of organisation which are best suited to their distance from the markets, this distance does not diminish the relative net income when compared with the value of the farm and with the total working expenses.

In sugar-beet farms the increase in the distance from the sugar factory or from the railway rapidly diminishes the profits, and the net returns of the farm diminish as the ratio between the average under beets and the whole farm increases. In all the other forms of organisation, in the farms that cultivate potatoes on a great scale for distilling, which take to the market, under the form of alcohol, a product of high commercial value, in farms in which cereals predominate, the distance from the market is of secondary importance, provided that the draught animals used for hauling the produce and for seeding and harvesting find employment during the less busy season.

The distances must be considerable and the roads very bad to require extra draught animals to the extent of causing, in the organisation of the farm, substantial changes for the improvement of the ratio between the raw produce and the produce which is carted away. Thus, as the distance from markets increases, cereals gradually replace hoed crops (beets, potatoes), and cereals in their turn are replaced by live-stock.

Beyond a certain point live-stock farming predominates, because it is the one that least of all suffers from the distance of the markets.

Lastly table IV gives some figures collected by the author to show the intimate connection between the extension of hoed crops and the need for occasional labour.

TABLE I.

		Group I	Group II	Group III	Group IV	Group V	Group VI
	1. Progressive number of farm	N. B. — Dealing with averages, the figures for each farm cannot be given here.					
Generalities	2. Class to which the farm belongs as to area						
	3. Distance from the farm to the railway station in miles	4.6	3.2	3.2	1.4	1.3	3.2
	4. Total value of farm in £. s. d. per acre of cultivated area	£ s d 23 10 4	£ s d 24 7 10	£ s d 22 10 1	£ s d 38 8 4	£ s d 37 16 5	£ s d 24 8 8
	5. Returns per acre (according to the land tax or land register)	—	—	0 5 2	0 11 1	0 10 1	0 5 6
Buildings, live and dead stock	6. Buildings; value per acre	10 18 1	13 8 7	12 5 1	12 12 8	13 1 5	15 18 4
	7. Machines and implements; value per acre	1 2 3	1 19 9	2 1 11	1 17 10	1 15 5	2 7 0
	8. Animals; value per acre	2 11 4	2 16 11	2 12 6	4 15 6	3 11 3	2 14 11
Animals per 100 acres	9. Number of normal head of large stock	15.7	17.0	15.1	20.4	19.0	16.4
	10. Number of normal draught stock, 1 ox = $^{2}/_{3}$ horse	3.1	3.5	3.3	7.6	4.1	3.7
	11. Number of horses only	2.4	2.7	2.1	2.7	3.0	2.3
Distribution of arable area	12. Area of meadows in % of total cultivated area	8.2	16.0	12.5	8.5	7.1	14.2
	13. Area of meadows and permanent pastures in % of cultivated area	11.7	18.5	15.6	10.0	7.9	18.6

Distribution of arable area	14. Area under cereals in % of cultivated area	46.0	63.9	54.2	53.1	53.0	55.0
	15. Area under hoed crops in % of cultivated area	12.4	19.4	25.0	14.3 16.9	27.2	20.0
	16. Area under leaf crops in % of cultivated area	12.6	4.8	7.2	4.1	5.4	8 5
	17. Area under forage and first clover hay in % of cultivated area	28.6	11.7	13.5	11.5	14.3	15.7
	18. Area under fallow in % of cultivated area	0.4	0.2	0.1	0.1	0.1	0.8
Principal Crops in cwt. per acre	19. Wheat . . . cwt.	17.33	13.97	15.04	20.25	19.58	13.51
	20. Rye . . . »	15.87	13.05	13.35	17.10	16.47	12.80
	21. Barley . . . »	16.96	15.25	16.84	19.94	15.95	13.34
	22. Oats . . . »	16.91	14.25	13.45	20.09	19.22	13.53
	23. Colza . . . »	11.56	79.94	—	11.20	—	—
	24. Sugar beets . . . »	169.85	213.02	—	278.34	266.55	247.81
	25. Potatoes . . . »	88.61	102.01	109.78	111.48	112.64	93.65
	26. Production of milk in gallons per daily ration per head of milch-cattle . . . gals.	1.50	1.41	1.41	1.58	1.50	1.52
		£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
	27. Value of total production of farm, per acre	4 3 8	5 15 10	5 18 5	9 6 3	8 8 0	5 15 7
	28. Total expenses of farm, per acre	3 6 10	5 9 2	5 7 1	6 19 2	5 19 4	5 16 8
	29. Net returns of farm, per acre	0 16 10	0 6 8	0 11 6	2 7 9	2 8 8	—0 1 1
	30. Interest represented by net returns in relation to value of farm . . . %	4.2	0.8	2.8	7.1	6.4	— 0.2

TABLE I.

		Group I	Group II	Group III	Group IV	Group V	Group VI
		£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Distribution of total receipts of farm per acre of cultivated area	31. Receipts from sale of produce of the soil	2 2 1	2 4 8	1 17 1	5 7 2	5 1 11	1 19 11
	32. Receipts from breeding cattle	1 4 11	1 16 8	1 8 4	2 12 2	2 2 0	1 16 4
	33. Receipts from distillery	0 1 9	0 12 10	1 14 1	0 4 7	0 3 2	(0 15 10)
	34. Receipts from draught animals	0 1 2	0 2 9	0 1 10	0 2 10	0 2 7	0 2 7
	35. Receipts from various sources	0 1 8	0 2 3	0 3 1	0 3 5	0 1 8	0 3 5
	36. Total receipts of farm	3 11 8	4 19 1	5 4 6	8 10 2	7 11 5	4 18 1
Expenses per acre of cultivated area	37. Seeds	0 2 3	0 3 4	0 2 10	0 3 5	0 3 3	0 3 1
	38. Manures	0 7 8	0 10 11	0 9 10	0 15 9	0 15 8	0 9 10
	39. Food	0 8 0	0 11 7	0 9 0	1 0 6	0 15 4	0 12 3
	40. Breeding stock	0 2 8	0 11 3	0 6 8	0 15 7	0 8 0	0 9 6
	41. Purchase of potatoes (excluding distillery farms)	—	0 0 4	0 0 8	0 0 6	0 0 1	(0 0 2)
	42. Distillery	0 2 7	0 2 11	0 9 6	0 1 2	0 0 7	(0 4 5)
	43. Salaries and wages	1 2 2	1 13 8	1 12 5	2 2 2	1 16 1	1 17 5
	44. Salaries in kind	0 6 3	0 5 10	0 5 5	0 7 2	0 8 10	0 4 3
	45. Draught stock	0 3 1	0 4 2	0 4 7	0 6 7	0 4 10	0 4 9

	48. Sundries		0 4 8	0 7 6	0 8 1	0 9 1	0 7 10	0 7 4
	49. Total expenditure of farm		2 4 7	4 14 4	4 12 1	6 4 7	5 4 7	4 18 1
Pro rata of returns in % of total returns	50. Sale of produce of the soil	%	58.1	45.7	35.5	63.4	67.3	40.7
	51. Breeding stock	»	36.0	36.6	26.4	30.0	27.8	37.0
	52. Distillery	»	1.9	12.4	33.4	3.0	(2.1)	(16.1)
	53. Draught stock	»	1.6	3.3	1.7	1.6	1.7	2.7
	54. Other sources	»	2.4	2.0	3.0	2.0	1.1	3.5
Pro rata of expenses in % of total expenses	55. Seeds (V and VI not given)	»	3.7	3.6	3.2	3.1	—	—
	56. Manures	»	14.6	12.1	10.9	13.9	—	—
	57. Forage	»	15.1	11.9	9.7	16.1	—	—
	58. Breeding cattle	»	4.9	9.9	6.7	11.1	—	—
	59. Purchase of potatoes for distillery	»	0.2	0.4	0.7	0.4	—	—
	60. Distillery	»	2.7	3.4	10.7	1.0	—	—
	61. Salaries and wages	»	38.3	36.1	35.0	34.3	—	—
	62. Draught stock	»	4.0	4.7	4.8	4.8	—	—
	63. Upkeep of buildings and improvement of farms	»	2.6	3.2	2.9	2.3	—	—
	64. Upkeep of machines and implements	»	6.6	6.4	6.2	5.7	—	—
	65. Sundries	»	7.3	8.3	9.2	7.3	—	—

TABLE II.

	Total daily cost	Management and insurance	Use of buildings	Use of machines and implements	Attendance	Feeding	Days work per year	Cost of one days work
For a draught horse								
	s d	d	d	d	d	s d		s d
Average of 23 farms .	1 9.51	3.52	0.38	1.14	1.80	1 2.65	255	2 6.93
Maximum	2 5.40	5.52	1.14	2.57	3.62	1 7.22	290	3 7.68
Minimum	1 2.36	2.57	0.10	0.48	0.95	0 8.75	190	1 8.46
For a draught ox.								
	s d	d	d	d	d	s d		s d
Average of 13 farms .	1 2.18	2.47	0.38	0.19	1.05	9.99	133	3 4.35
Maximum	1 9.03	3.62	1.05	0.67	1.52	1 3.32	205	4 8.43
Minimum	0 7.23	1.51	0.10	0.10	0.19	0 3.62	85	1 11.12

	Total daily cost excluding those products of the farm which are not saleable in the market.	Subdivisions					Including those farm products for which there is no market		
		Management and insurance	Use of buildings	Use of machines and implements	Attendance	Concentrated foods	Value of these products	Total value of food	Total daily cost
Per head of large breeding stock.									
	d	d	d	d	d	d	d	s d	s d
Average of 22 farms	6.47	1.05	0.30	0.16	1.81	3.62	6.28	0 9.42	1 0.75
Maximum	10.66	2.09	0.86	0.38	3.14	7.04	10.66	1 1.13	1 4.84
Minimum	3.90	0.48	0.10	0.10	0.86	1.33	2.57	0 5.80	0 9.52
For 100 sheep									
	s d	d	s d	d	s d	s d	s d	s d	s d
Average of 10 farms	4 4.15	4.76	0 5.90	0.19	1 0.94	2 4.36	5 4.90	7 9.25	9 9.04
Maximum	12 1.14	9.42	1 9.22	1.14	1 10.46	2 2.36	8 11.34	13 2.15	15 1.75
Minimum	2 6.93	2.38	0 1.14	0.10	0 9.42	0 7.04	2 5.50	5 1.38	6 3.65
For 10 pigs									
	s d	d	d	d	d	s d	s d	s d	s d
Average of 15 farms	1 8.17	1.43	2.00	0.48	3.14	1 1.13	1 1.42	2 2.55	2 9.59
Maximum	3 7.87	3.90	10.18	2.38	6.38	2 312	2 7.88	3 7.29	4 5.28
Minimum	0 8.85	0.48	0.38	0.01	1.52	0 523	0 5.42	1 4.65	1 8.65

TABLE IV.

District	Casual labour per 100 acres	Area under hoed crops in % of total	% of cultivated area belonging to farms under 50 acres
—	—	—	—
Magdeburg	15.37	21.0	33.3
Stralsund	12 94	10.3	32.0
Merseburg	11.13	18.7	38.5
Breslau	10.68	15.3	37 2
Liegnitz	8.09	14.1	48.2
Stettin	7.60	13.3	24.8
Hildesheim	7.52	17.4	56.3
Bromberg	6.67	16.2	28.9
Oppeln	6.43	17.1	56.5
Potsdam	6.35	14.4	25.8
Frankfurt	6.03	16.8	39.4
Erfurt	5.46	13.5	66.9
Allenstein	4.98	10.1	27.9
Marienwerder	4.89	14.2	28.0
Hannover	4.45	10.3	62.7
Danzig	4.13	13.8	36.3
Posen	3.92	17.7	38.0
Average	7.44	15.0	
Köslin	3.48	13.1	31.2
Lüneburg	3.03	12.4	46.5
Cassel	2.87	10.7	70.2
Gumbinnen	2.79	7.2	28.8
Königsberg	2.50	5.4	17.5
Köln	2.50	13.7	67.3
Minden	1.98	8.7	68.0
Düsseldorf	1.54	12.3	61.1
Schleswig	1.50	2.2	25.0
Arnsberg	1.41	11.3	61.7
Aachen	1.25	8.9	74.0
Wiesbaden	1.05	13.8	93.0
Stade	0.85	6.1	55.6
Münster	0.48	7.4	56.2
Osnabrück	0.36	8.7	80.2
Koblenz	0.24	15.3	93.6
Trier	0.20	13.5	87.3
Aurich	0.12	3.1	38.7
Average	1.58	9.7	

TABLE III.

Brogressive number of farms	Total labour per acre of cultivated area in summer days of an adult labourer					Total animal labour per acre of cultivated area in summer days of a horse			Total cash outlay per acre of cultivated area	Distribution of crops				Fallow
	Days work						of which							
	Men	Women	Childen	Piece work	Total	Horse	Ox	Total	£ s d	Cereals %	Hoed crops %	Leaf crops %	Forage and first cut of clover	%
						Farms with considerable beet culture								
1	14.22	6.60	0.27	2.19	23.29	6.23	2.64	8.87	9- 6-11	46.5	40.0	1.8	10.7	—
2	14.59	0.45	0.19	4.03	19.26	6.78	2.68	9.46	7-10- 8	52.8	23.4	2.7	21.1	—
3	9.82	5.02	0.24	4.14	19.21	7.69	3.15	10.85	8- 9- 4	54.6	31.7	3.0	11.7	—
4	6.63	2.81	0.13	2.72	12.29	7.05	—	7.05	5- 2- 0	64.8	23.1	5.3	6.0	6.8
5	4.62	2.85	0.33	2.97	10.66	4.11	1.28	5.39	3- 3- 3	44.2	34.3	6.9	11.4	3.2
Average	9.98	3.53	0.24	3.21	16.94	6.37	1.95	8.32	6-14- 5	52.6	30.5	3.9	12.2	0.8
						Farms with considerable culture of potatoes for distilling								
1	8.34	5.19	0.13	2.44	16.12	5.09	1.34	6.43	4-18- 4	57.0	24.0	10.2	6.6	2.2
2	8.46	2.25	0.38	3.45	14.53	3.83	2.10	5.93	3- 9- 1	51.9	32.6	—	15.5	—
3	6.33	4.05	0.22	2.08	13.63	[illegible]	1.94	6.77	3-13-10	49.2	30.6	7.5	12.7	—

4	6.41	1.56	0.20	2.26	1.09	2.58	2.96	5.54	4- 3- 3	55.8	31,0	—	13.2	—
5	5.11	2.20	0.24	2.80	10.36	4.23	1.74	5.97	4-17- 1	61.4	29,6	3.4	5.4	0,2
Average	6.93	3.05	0.25	2.89	13.11	4.11	2.02	6.13	4- 4- 4	55.0	29,6	4.2	10.7	0.5
Farms with considerable cereal culture														
1	7.48	3.81	0.69	4.67	16.64	4.09	2.80	6.89	5- 9- 6	62.8	19.3	6.6	11.3	—
2	7.15	5.55	0.41	1.51	14.63	5.89	—	5.89	4-13- 2	59.1	19.2	10.0	11.7	—
3	7.37	2.27	0.91	2.58	13.13	5.04	0.38	5.43	5-14-10	62.8	28.2	1.8	7.2	—
4	3.83	7.12	0.26	1.92	13.13	6.69	1.97	8.56	3- 9- 4	57.9	20.2	3.4	18.5	—
5	7.62	2.79	—	2.46	12.88	4.33	1.09	5.42	4- 0- 6	57.3	27.4	4.7	10.6	—
Average	6.69	4.30	0.45	2.63	14.08	5.19	1.25	6.44	4-13- 5	60.0	22.9	5.3	11.8	—
Farms with considerable culture of forage plants														
1	8.31	3.03	0.22	1.20	13.27	5.53	0.75	6.28	8- 3- 1	42.1	15.8	5.6	36.5	—
2	9.97	1.80	0.03	0.14	11.95	2.51	0.26	7.77	4- 3- 4	27.2	4.2	15.7	52.9	—
3	4.34	1.91	0.30	1.36	7.91	3.53	1.44	4.97	3-12- 3	64.2	16.8	4.7	13.2	1.1
4	3.58	2.48	0.01	1.19	726	4.83	1.62	0.45	3- 2- 8	48.5	15.2	13.5	22.8	—
5	4.68	0.60	—	0.69	598	2.82	0.17	2.98	1-16- 5	58.0	9.0	20.8	12.2	—
Average	6.18	1.96	011	1.02	927	4.84	0.85	5.69	4- 3- 3	48.0	12.0	12.3	27.5	0.2

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS.

961 HOLLMANN, DR. **The Dairy Industry in Western Siberia and the Possibilities of its Extension.** (Die Meiereiwirtschaft Westsibiriens und ihre Entwicklungsmöglichkeiten). — *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, 27. Jahrgang, Stück 12, 13 and 14, pp. 182-186, pp. 197-198; pp. 211-214. Berlin, 23. and 30. März and 6. April 1912.

Russian Empire: Siberia

The great Siberian railway and its branches have already opened up an agricultural district of some 1 600 000 sq. km. (5 770 000 sq. miles), but only a comparatively small portion of this area serves for butter-production.

There are three large zones in Western Siberia, which are concerned in the export of butter to Europe: beginning from the west, the first is in the Government of Tobolsk, the districts of Ijukalinsk, Iara, Ischim, Jalutorowsk and Kurgan. The town of Kurgan is the centre of the butter-trade. A second zone lies in the Government of Omsk and stretches to the south, as far as the spurs of the Altai; the central point of the trade is Omsk. In the Government of Tomsk, there is the third zone, of which the centres are Kainsk and Tomsk. While towards the north are natural limits to the production of butter, the extension of the railway in the south will open up new districts for the butter trade, which will largely increase the present zones.

The capabilities of the dairy industry for improvement in the butter-exporting districts under discussion are, however, more important than their extension. Even where this industry is most developed, cattle keeping is in a very primitive condition. In the district of Kurgan on a farm of 170 to 200 acres only 4 or 5 cows are kept on an average, while in other districts there are still fewer. Further, throughout Siberia, the cattle live in the open both summer and winter; there are no cow-sheds, and at most the animals obtain some shelter from the snow in open sheds made of planks which afford them no protection from the cold.

The food in winter is very scanty, and for this reason the cows only give milk in summer when there is pasturage.

The Siberian cattle are considered to be a race of the north European stock which has become possessed of special characteristics through climatic conditions and crossing with Kirghiz and Central Asiatic races. They are small, poor-looking and thrifty. A cow gives a yearly average of 30 pood (1 080 lbs.) of milk, which has an average fat content of 5.35 %, sometimes reaching 7 and 8 %, and even more.

The importation of improved breeds from the west is at present out of the question, but the milk yield of the native race could be increased by a slight improvement in its treatment. This has been proved by an experiment carried out at the Experimental Farm at Alexandrinsk.

Eighteen of the peasants' cattle were bought; these were kept in summer on ordinary pasture, and spent the winter in a very unpretentious shed. They were fed according to their milk-yield on hay, roots, a little bran and grain.

The average milk yield per cow under this treatment reached 3850 lbs., *i. e.* more than three times as much as that of a cow kept in the manner customary among the peasants. Such improvement can certainly not be attained very quickly, but there are signs of the commencement at least of improved methods, especially in the districts of Kurgan and Tscheljabinsk, so that it is within the bounds of possibility that the improvement of cattle-breeding in Siberia may be accomplished relatively quickly under the influence of the important cooperative movement which is taking place there.

Already before the opening of the railway, a kind of melted butter was made in Siberia, the output of which still amounts to 17 ½ million lbs. yearly. The preparation of butter from cream was introduced into Siberia in the eighties by H. W. Wereschtschagin, but it was only on the opening of the great railway that there was any possibility of exporting this product.

In 1894, the first dairy was established in Kurgan for making butter from milk supplied by the peasants' cows. In 1896 there were in the Government of Tobolsk 13 dairies at work, including cooperative ones. The Government obtained Danish instructors, who founded many dairies, partly on their own account. Owing to the peasants' dislike of foreigners, the dairies have mostly passed into the hands of Russian owners, who in their turn, will have to give way to the increasing tendency to the formation of Cooperative Associations.

The initial difficulty in butter export was overcome by the founding in 1896 by a Danish speculator of an export firm at Kurgan, which also constructed dairies on credit. Later, it was amalgamated with subsequently established Danish firms under the name of the Siberian Company. Since 1900, the butter has been sent in special trains with refrigerator cars as far as the seaports on the Baltic.

At the beginning of 1911, there were in Western Siberia more than 3 000 dairies, of which more than a third were cooperative ones. In the Government of Tobolsk from 1897-1910 the following number of dairies were established annually:

1897 . .	20	1902 . .	82	1907 . .	153
1898 . .	16	1903 . .	62	1908 . .	100
1899 . .	11	1904 . .	62	1909 . .	122
1900 . .	37	1905 . .	87	1910 . .	130
1901 . .	33	1906 . .	135		

While at the commencement private dairies were in the ascendancy, those established during the last few years are mostly founded upon cooperative principles. The Government grants loans up to 3 000 roubles (£ 317), not more however than three quarters of the total cost. The loan is at 4 % interest and is to be repaid after five years.

The buildings of the dairies are, with few exceptions, very primitive and are made of wood; they are also provided with very simple apparatus. Thus in the Government of Tobolsk in 1910 only 6 were provided with steam power, 211 had horse-gins, while in 843 the apparatus was driven by hand. For separating, Alfa-Laval separators are usually employed. The employment of a large amount of capital is out of the question, because the Siberian dairies are only in work in the summer and also on account of the frequently insufficient milk-supply. The superintendents have for the most part (two-thirds) risen from the ordinary dairy labourers, only one third having had any special training; only a small number (1.79 %) are foreign experts. The yearly wages are 300 to 400 roubles (£32 to £42,12*s.*), often with a bonus for a good output of butter.

The quality of the fresh butter is usually moderate to good, often even very good; the faults of Siberian butter come more through transport and other circumstances than through faulty preparation.

Unfortunately, an increase in the water-content is noticeable; generally, however, this is less than that of the average European butter, but cases occur where the amount of water is abnormally high, which is a disadvantage to the Siberian butter trade.

The export of Siberian butter to the West amounted to:

1896	7 789	tons
1906	47 930	»
1908	55 490	»
1910	62 679	»

Of the total export in 1910, 82 % was sent in the months April to October. About half the butter exported in 1910 went to England, and of the other half, two-thirds to Germany and one-third to Denmark. The price of butter in Siberia has, owing to the great competition between the exporters, constantly risen. In the summer of 1910, the price of cooperative butter in Kurgan was 14.97 roubles per pood ($10\,{}^3/_4$ *d.* per lb.); but in 1911, considerably higher prices were realized. The prices are in the main satisfactory to the producers, but there is this defect in the trade: payment is not according to quality and therefore there is no incitement to improve the butter. For the removal of this objection, a Union of the West Siberian Cooperative Dairy Associations was founded in 1910; its seat is at Kurgan, and in 1910 it was joined by 181 Associations.

The aim of this Union is the regulation of the price of Siberian butter with regard to quality, and it undertakes the direct sale of this product. It has an office at Berlin, and is also connected with an English firm.

The butter is marked by points, 100 being the maximum, and priced according to quality. The results of the judging are published.

LARSEN, C., WHITE, WM. and BAILEY, D. E. **Effects of Alkali Water on Dairy Products.** — *Agricultural Experiment Station of South Dakota, Bulletin,* No. 132. Brookings, January 1912. **962**

United States

Alkali water, or water containing an unusual amount of soluble minerals, especially sulphates, is chiefly found in arid and semi-arid regions. The amount and kind of minerals contained in the water varies according to kind of soil, lay of land, kind of cultivation and climatic conditions. Alkali water was thought to be harmful to cows and unsuitable for butter washing. With a view to gaining information on this subject, the experiments reported in this Bulletin were conducted.

Careful analyses were made of the water from 14 wells, and that from one, which contained 7 358 parts of total solids per million parts water, and which also had the highest sulphate content (over a half) was selected.

This water had a distinct saline, acrid and sharp taste, but no stale or other undesirable flavours due to decayed organic matter; it was given to two lots of cows of three each. The animals were first put on a definite, normal ration and received ordinary water from the college well. The cows in Lot I (which were barren or not in calf) were fed soft water and those in Lot II (of which three were about 5 months along in the gestation period) received alkali water; they were given all the water they wanted three times a day. Then Lot I was changed to alkali water, and Lot II to soft; a preliminary period of ten days was allowed betwen each period for the animals to get used to the change; each experiment was carried on for a period of twenty-four days.

The milk and milk products needed for these examinations were obtained and made during the last seven days of the twenty-four day experimental period, and the milk of the cows was carefully examined to find out whether there was any physical difference in that from the two groups of cows.

The experiments may be classed under the following heads.

1. Chemical examination of average samples of milk from both lots.

2. Opinion of members of the Dairy Department and dairy students on the relative quality of the milk from the two lots of cows (during one period only).

3. The behaviour of the milk on addition of rennet.

4. The quality of the butter made from the cows under experiment.

The three cows of Lot I not in calf, were fed the alkali water continuously after the milk and butter data previously reported had been made. Cheese was made from the milk of this lot and compared with that from an equal amount of milk from the rest of the herd drinking normal water.

There were no changes in the curd and characteristics of the cheese and no apparent differences betwen that made from the milk obtained from the cows receiving alkali water and those receiving normal water, but the water-soluble protein was higher in the former.

The effect of washing butter in alkali water was then investigated. The cream was divided into two equal lots and churned separataly, the butter from one lot was washed in ordinary water, that from the other in alkali water. Samples of both were then submitted to the judgment of experts.

CONCLUSIONS.

1. Alkali water does not increase the mineral content of milk.

2. The composition of the milk ash was somewhat altered, alkali water increasing the sulphate and potassium content, but the difference was not sufficient to affect the normal properties of the milk and its products.

3. The coagulability of milk with rennet was not affected by feeding alkali water to cows. Milk low in calcium, however, required most rennet for curdling, and such milk is produced by cows well advanced in the gestation period.

4. Alkali water, if containing decayed organic matter, is dangerous to use for dairy cows, in cleaning dairy utensils, or in the manufacture of dairy products.

5. Butter washed in alkali water and containing a normal percentage of salt did not differ materially from that washed in normal water; unsalted butter washed in the former was scored about one point lower in quality than that for which the latter was used.

Though the alkali wash-water contained a larger number of non-acid-producing germs, these were almost entirely supplanted by a still larger number of acid-producing germs in the butter shortly after its manufacture.

6. The cheese made from the milk produced by cows fed alkali water was normal, but from analysis, the brine-soluble protein is low and the insoluble protein high; these differences were, however, much diminished after the cheese had been cured one month.

OLSEN-SOPP, OLAV JOHANN. " **Taette ", the Preserved Curd of the North, and Similar Milk Preparations. Their Importance as Food.** (Taette, die urnordische Danermilch u. verwandte Milchsorten, sowie ihre Bedeutung für die Volksernährung). — *Centralblatt für Bakteriologie*, 33. Bd., No. 1/6, pp. 1-54. Jena, 17. Februar 1912. **968**

Sweden Norway

In Sweden and Norway a preserved milk has long been known under the name of " Taette ", and, especially in former times, it played an important part as food for the rural population. This milk is dense, sticky, sometimes ropy, rich in carbon dioxide and possesses a somewhat acid taste and aromatic odour. It is prepared from milk still warm from the cow to which is added some old " Taette " which has been dried on straw or on linen cloths, or if good fresh " Taette " is available the bottom of a milk vessel is rubbed with it and the fresh warm milk is poured over it. Within three to five days the new " Taette " is ready. It is the product of the action on the milk of several bacteria living in symbiosis, and of a ferment.

The Author has examined these organisms and found that those present in " Taette " have not always the same composition, and that this depends on the age of the preparation.

A) The following were always present:

1. A short *Streptobacillus* (*S. Taette*) which sometimes has almost the appearance of a streptococcus. It grows in jelly-like chains and causes the ropiness of " Taette ".

2. *Lactobacillus Taette*, similar to *Bacillus Bulgaricus*, but possessing a greater acidifying power than the latter; it acidifies in a short time all substances containing starch.

3. *Saccharomyces Taette* (*S. T. major* and *S. T. minor*). Of all three kinds, several varieties are found, according to the place of origin of the " Taette ". These ferments grow at + 3° C, when they are together in the milk, but they develop better at the usual room temperature.

B) Very often the following are also found in " Taette ":

1. Forms of *Monilia;*
2. Forms of *Torula;*
3. *Lactococcus;*
4. *Oidium lactis*, this especially in bad " Taette ".

After examining the action of the " Taette " micro-organisms on several culture media: solutions of sugar, beer wort, bread dough, etc., the author tried to produce new " Taette " by uniting the several organisms grown in pure cultures. This succeeded very well, and whilst these organisms could be grown only with difficulty in pure cultures, their development became very good as soon as they were united again in the right proportions in milk, and allowed to resume their symbiotic life.

By using " Taette ", another preserved milk " Kjaeldermelk " (Cellar milk) used to be commonly made in spring in Norway and this was the only milk that the inhabitants of the valleys had during the summer when all the cattle used to be driven into the mountains. Its preparation is simple: Milk warm from the cow is mixed in a kettle with one third of its volume of water, well boiled and then placed in a cellar in large wooden vessels previously scalded with juniper decoction and then rubbed with " Taette " The vessels are covered with muslin and the milk, after the first week, is well mixed every day. Milk prepared in this way keeps good throughout the summer; it has the characters of a good sour milk, and resembles " Taette " in that it does not grow mouldy nor does it putrify.

The author states that " Taette ", besides having as high a hygienic value as Joghurt, Kefir, and similar milk preparations, for it contains a bacillus possessing a high fermentative energy, has one advantage over all its competitors: namely, it requires to be renewed only at intervals of several weeks, and the " Kjaeldermelk " prepared with " Taette " keeps for many months.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

The Sugar-Season of 1910-11 in Sweden.

964

1. — Die schwedische Zuckerindustrie 1910-1911. — *Die Deutsche Zuckerindustrie,* XXXVII, Nr. 17-18, pp. 373-374, 394-395. Berlin, 26. Apr. — 3. Mai 1912.
2. — Aus Schweden. — *Ibid.*, Nr. 8, p. 173. Berlin, 23. Februar 1912.

The following figures give the data of the sugar-campaign of the last five seasons in Sweden (1):

Sweden

Season —	Area: acres	Total yield: cwt.	Yield per acre: cwt.
1910-11	86 817	1 087 650	250
1909-10	82 678	872 770	213
1908-09	79 256	886 700	223 ½
1907-08	77 087	768 980	198
1906-07	77 779	1 013 060	260

The 1910-11 season. — In 1910 sugar-beets were grown in eight governments; the largest area was in Malmö, 75 % of the total;

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(1) Cf. those for Germany, *B.* Feb. 1912, No. 403, and for France, *B.* May 1912, No. 845. *(Ed.).*

this had also the heaviest average yield, 13 tons ½ cwt. per acre, and a maximum of 14 tons.

Factories. — The working sugar-factories numbered 24, of which 16 were in Malmö, including three sugar installations from which the juice is carried by pipes to the central factories.

The working of the beets generally takes place from October to January, this season from Oct. 5th to Jan. 9th, with a subsidiary period of 27 days average in 17 factories. The amount worked by one factory varies considerably from year to year, as shown by the following figures:

	Maximum tons.	Minimum tons.	Average tons.
1910-1911	86 456	12 642	46 048
1909-1910	68 336	3 201	32 922
1908-1909	71 038	2 582	36 936
1907-1908	76 853	2 675	36 782
1906-1907	88 324	3 740	51 793

Out of the 24 factories, 17 grew beets for themselves, but only 4 on a large scale, with a maximum of 25 %; taken together, the beets grown by factories only amount to 3.6 % of the total crop.

Sugar-content of the beets. — The sugar-content of the beets in 1910 varied between 16.15 and 17.76 %, compared with 14.89 to 16.57 % in 1909. In 15 factories in 1910-11 the sugar-content of the beets reached 17 to 18 %,

Crude-sugar. — The crude sugar product was:

1st product.	163 043	tons
2nd »	8 131	»
Total . . .	171 174	tons

This gives a yield of 15.72 %; reducing the 2nd. product to the equivalent of the first by multiplying by 0.75, the yield falls to 15.53 %. The previous year it was 14.07 %, and 1906-07 was the only year in which it was exceeded, *viz.* 15.78 %. A diminution of the 2nd product is to be noticed; in 7 factories it was only 0.25 %; none produced any 3rd.

Refining. — In refining, carried out directly in only one factory, a yield of 92.7 % of refined sugar and 5 % of molasses was obtained. In the first working, 13 253 tons of molasses were produced, *i.e.* 1.21 % of the weight of the beets; in 11 factories it was not more than 1 %, in 8 it was 2.3 %. The molasses, besides being used in the sugar-extraction, were used for feeding-stuffs and distilling.

The production of beet slices was 573 000 tons, of which 7 200 were from the Steffen process; they were used almost exclusively for stock-feeding by the beet growers.

Prices. — The average price of beets was 1*s* 5*d* per cwt., as compared with 1*s* 4 ½*d* the previous year. The price of molasses was 2*s* 3*d* to 3*s* 7*d* per cwt., and that of slices 1*s* 8*d* per ton. The average price of 1st product refined sugar was 17*s* 4*d* per cwt.

Consumption. — Of the 128 775 tons of refined sugar produced in the 1910-11 season, 127 845 tons were put on the market, as compared with 114 000 the previous season. In the year 1911 the total consumption was 124 748 tons (including 1 730 imported), equivalent to 50.4 lbs. per inhabitant; the previous year it was 48 lbs. To this should be added 1 524 tons of syrup (previous year 1 996 tons) produced in three refineries, as well as 15 215 tons of syrup and molasses imported in 1911.

Outlook. — As there has not yet been any legislative decision on the duty, the agreement between farmers and the sugar trust will only be continued till the 1912-13 season, with the same guaranteed acreage as the previous year. Owing to the scarcity of seed, the trust has fixed the amount at 18 lbs. per acre instead of 21 ½ lbs. as in the previous season.

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

The Consultative Committee for the Destruction of Parasites Injurious to Agriculture in France. (Décret instituant un Comité consultatif des épiphyties chargé de l'étude des procédés de destruction des parasites nuisibles à l'agriculture). — *Journal officiel de la République française*, 44^e Année, No. 117, p. 4079. Paris, 29 avril 1912. **965**

The President of the French Republic has decreed under date of Feb. 19, 1912.

France

" Art. 1. A technical Commission is instituted at the Ministry of Agriculture, which will assume the title of 'Comité consultatif des épiphyties' ".

" Art. 2. This Committee is charged with the study of questions relating to the insect, cryptogamic and other parasites which are injurious to agriculture, and notably with the means to be taken and the measures to be employed for the prevention and control of parasites."

" Art. 3. The Consultative Committee consists of the Director General of the Waters and Forests, the Director General of Customs, the Director of the Sanitary and Scientific Services, and of the Repression of Frauds, the Director of Agricultural Instruction and of the Agricultural Services, the Chief of the Office of Agricultural Intelligence, two general Inspectors of Viticulture, two general Agricultural Inspectors, the Inspectors of the Phytopathological Service.

The Committee further includes 12 other members nominated by the Ministry of Agriculture, of whom one third must retire each year."

966 **An Order Appointing a Commission for the Classification of Useful and Harmful Birds**. (Arrêté instituant une Commission de classement des Oiseaux utiles et des Oiseaux nuisibles). — *Journal officiel de la République française*, 44e Année, No. 116, pp. 4054-4055. Paris, 28 avril 1912.

On April 22nd 1912, the Minister of Agriculture issued the following order:

" Art. 1. — A temporary commission is appointed at the Ministry of Agriculture for the purpose of establishing on a scientific basis, for the whole of France, a complete classification of useful and harmful birds, with indications of the degree of their utility or harmfulness, and with mention of those which present mixed characteristics according to the season or district. **France**

" Art. 2. — This Commission is to consist of the Councillor of State, Director General of Waters and Forests, president; the Director of the Sanitary and Scientific Services and of the Repression of Fraud; the Director of Agricultural Instruction and of the Agricultural Services; the Professor of Agricultural Zoology at the National Agricultural Institute; the Agent of the Waters and Forests entrusted with the direction of the 1st Bureau; the Agent of the Waters and Forests especially attached to the Service of hunting, secretary ".

Twenty other members chosen from the persons most conversant in the matter, form part of the above Commission.

" Art. 3. — The Councillor of State, Director General of Waters and Forests, is entrusted with the execution of the present Order ".

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

967 GATIN C. L. **The Effect of Road-Tarring on the Neighbouring Vegetation** (1). (Le Goudronnage des routes et son action sur la végétation avoisinante). — *Annales des Sciences Naturelles*, 88e Année, IX série, Botanique, Tome XV, Nos. 2 à 4, pp. 165-252, 12 figg., pl. I. Paris, mars 1912.

In this paper the writer discusses the present condition of the question of tarring roads and its effect on the neighbouring vege- **France** tation, so far as it has been ascertained by previous research and by his own observations and experiments.

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(1) See *B*. Nov.-Dec. 1911, No. 3227. (*Ed*).

His conclusions are the following:

Effect of the vapours

According to the experiments of Haselhoff and Lindau, Sorauer, Olivier and Mirande, and also from the common observation of gardeners, tar vapours appear harmful to plants. Experiments made in closed boxes filled with tar-vapour have always shown serious damage to the plants. M. Mirande's experiments, which were carried out in the open air, give much less definite results.

The practical experiments which have hitherto been made on the action of vapours have not given appreciable results (Avenue du Palais-de-Glace); there are relating to this subject only the notes made by M. Forestier respecting a border of *Sedum spurium* which was scorched under special conditions. On the other hand, it is well-known from gardeners that the presence of tarred palings or paths is injurious to plants.

The Effect of Dust. The experiments made by Griffon, and those carried out by the writer at Longchamp and at Fleuriste de la Ville, show that the dust from tarred roads is, in itself, capable of producing on the leaves of herbaceous or woody plants, injuries similar to those which have been observed in practice.

Does this dust act through contact, or through the vapours which it emits? An experiment on leaves repeated a number of times, in which they have formed cork on their upper surfaces when their lower surfaces had been covered with tarry dust, lends support to the latter hypothesis.

Nature of the injuries produced on the plant.

The experiments of Haselhoff and Lindau have determined from the morphological point of view the withering of leaves, which become spotted or brown and appear varnished.

From the anatomical standpoint, the cells are plasmolysed, the chlorophyll destroyed, and drops of oil and tannin appear.

In plants gathered from the side of tarred roads or subjected to M. Gatin's experiments, withering was of rare occurrence and confined to soft plants, but the results of scorching were observed in the brown discoloration or varnishing of the leaves, and in the formation of layers of cork. The plant thus attempts to defend itself, as in the open the attack is much less severe than in a closed vessel.

The writer obtained withering effects by dusting over the leaves of pelargoniums with powdered pumice containing 1 % of phenol. Some hours after treatment, the leaves became heavily spotted, and withered.

Tar dust further produces a stunting of the vegetation and a slackening of the activity of the cambium and hinders the storing of starch.

Practical Conclusions. There is no doubt that the use of gas tar on town roads, which are much exposed to the sun, and where the traffic is heavy, is almost fatal to herbaceous or soft plants along the sides. It is true that some plants are more sensitive than others, as has been proved in the case of the avenue of the Bois; but it appears that all vegetation growing by the side of these much frequented roads suffers in a greater or less degree from the effect of the tar dust. In any case it is impossible to make a good show of plants along them.

But, on the other hand it seems that hitherto the injury caused by the use of tar is confined to particular cases. No complaints have so far been made about the tarring of the roads in England, the United States, or Switzerland. In England, especially, the practice has obtained for a long time, and meets with general approval. There is a contradiction, which is, however, only apparent. The action of tar varies with certain factors.

1. When there is much traffic, a very fine dust rises, due to wear and tear, even from tarred roads; this falls upon the leaves of the neighbouring plants.

2. Insolation causes the injury to be greater, while abundant rain, by washing the leaves, minimises the harmful action. There is thus a climatic influence, which explains the fact that in countries which are colder than France (*e.g.* Great Britain), the use of tar is innocuous.

3. Local causes, such as the violence and direction of the winds, should be taken into consideration.

4. The nature of the tar. The refined tar used in England is doubtless less injurious than the raw product.

5. The nature of the plants. Such plants as possess a thick cuticle (*e.g.* ivy), or southern species like palms, certainly have greater powers of resistance.

6. The action of tar shows itself after some time; it may at first seem harmless, but after the lapse of several years, we may be surprised to find the trees bordering tarred roads injured in a manner which could not have been foreseen.

So far it is only in town roads with heavy traffic that steps need to be taken to remedy the effects of tarring.

It must not be thought that the injurious action of the latter is confined to the district of Paris. On the contrary, it occurs wherever the conditions of light and of traffic enumerated above happen to occur simultaneously.

968

PETRI, L. **The Formation and Physiological Sygnificance of Endocellular Fibres in Vines Affected by " Roncet ".** (Formazione e significato fisiologico dei cordoni endocellulari nelle viti affette da " arricciamento "). — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Sc. fis., matem. e nat.* Vol. XXI, 1° sem., fasc. 7, pp. 505-511, 1 fig. Roma, 14 aprile 1912.

The author's previous researches have shown the presence of solid, endocellular fibres of the same nature as the lining membrane of the cells which they traverse, in vines affected with the form of progressive rachitis known under the name of " court-noué " or " roncet ", and for which he suggests the term " arricciamento " in Italian.

Italy

Later researches on infected vines have led to the conclusion that the first visible change takes place in the cambium at the top of the stock, and consists in an abnormal process of secretion, which gives rise to endocellular fibres.

This degeneration takes place slowly and progressively and can only be localised during a short time. It is not accompanied at the beginning of the disease by a diminution in the activity of the cambium or a cessation of the morphogenetic properties of the terminal meristems.

This degeneration, according to the writer, is the chief symptom of " roncet ". It persists during the whole course of the disease, which is communicable by grafting, and is of constant occurrence in all the most commonly cultivated varieties of American and Italian vines, while the external malformations vary according to the individual peculiarities of the plants attacked. Rachitis itself is only a second stage.

969

PANTANELLI, E. **The Nature and Structure of the Ground as Factors in the Occurrence of the Vine Roncet.** (Su la ripartizione dell' « arricciamento » della vite, secondo la natura e la giacitura del terreno). — *Le Stazioni sperimentali agrarie italiane*, Vol. XLV, fasc. 4, pp. 249-301. Modena, 1912.

The author has made researches in Sicily and Apulia on the nature, structure and configuration of the ground where the disease " roncet " attacks vines, which were healthy when planted.

Italy:
Sicily, Apulia

The general results of his investigations were: that the soil of the first centres of infection was characterised by the fineness of its particles, with predominance of those readly carried over by water, by the absence of stones, gravel and coarse sand, the slight depth of true soil, and by a compact subsoil resting on a hard or impermeable, or a spongy and damp base in the form of a trough or a basin, and in any case with little or no drainage. These conditions result in compactness, insufficient aeration, and difficult drying in the stratum of soil penetrated by the deepest roots, which are those formed by the plants in the first years following planting.

BACTERIAL AND FUNGOID DISEASES

FUNGOID DISEASES.

970 TORREND, C. **Second Contribution to the Study of the Fungi of Madeira.** (Deuxième contribution pour l'étude des champignons de l'île de Madère). — *Broteria,* Vol. X, Série botanica, fasc. 1, pp. 29-49, 1 fig. Salamanca, Abril 1912.

Madeira To an article published in 1909 in the same periodical, the writer adds this contribution, with 262 species of fungi new to Madeira; many of them, including some parasitical on cultivated plants, are new to Science. Besides these there is a list of species found in new localities or in new substrata.

971 RAVAZ, L. and VERGE, G. **On the Temperature required for the Infection of Vines by Mildew.** (Conditions de développement du Mildiou. Température nécessaire à la contamination). — *Le Progrès agricole et viticole,* 29ᵉ Année, No. 16, pp. 485-488. Montpellier, 21 avril 1912.

France Experiments made by infecting young and adult leaves of Aramon at different temperatures with drops of water containing mildew conidia, have shown that vine leaves can be infected, even at a low temperature, consequently from the commencement of the vegetative period, if at that time active spores of the fungus are present. But if Prillieux is right as to the development of the winter spores the leaves can only be infected when they are covered with water at a temperature of 13° C. at lowest.

The conidia only germinate in water; in air, even if damp to saturation point, they give rise to no zoospores. In very moist air, the conidia only preserve their germinating property for five days at the most; in a drier medium they lose this power very rapidly, probably simply as a result of desiccation.

RAVAZ, L. and VERGE, G. **The Influence of the Humidity of the Air and of the Vine Stock on the Development of Vine Mildew.** (Conditions de développement du Mildiou. Influence de l'humidité de l'air et du cépage). — *Le Progrès agricole et viticole,* 29e Année, No. 15, pp. 455-461. Montpellier, 14 avril 1912. **972**

The writers made experiments in January and February 1912 on leaves of Aramon and Grenache in which *Peronospora* was present in a latent condition.

They came to the conclusion, that the development of the parasite in the leaf tissues and its appearance on the exterior in the form of white patches (conidiophores) depend upon the temperature, the humidity of the air, and upon the moisture present in the tissues, or, so to speak, upon the internal humidity of the plant.

France

At the most favourable temperatures (about 25° C.), the shortest time necessary for the appearance and complete formation of the conidiophores is about 10 hours, but this is only when the atmosphere is saturated with moisture (97°—100°). A whole night, or a whole day of great humidity is required for the development of an infection of this parasite in the best temperature conditions. Nevertheless, too much water is injurious to *Peronospora*; it prevents its attacks in the same way as does drought, probably by hindering respiration. Although very continuous rain brings about the infection of leaves, it hinders, at all events for a short time, the subsequent spore formation.

With regard to the effect of the stock on the development of this parasite, the writers observed that on Grenache, which is very susceptible to the disease, conidiophores developed in a relatively dry atmosphere.

This was also found to be the case under glass, while Aramon remained immune under the same conditions. The explanation of the different method of behaviour of the two vine-stocks seems to be that while Grenache is a vine which remains a long time herbaceous, juicy and, as it were, saturated with water, Aramon shows just the opposite conditions.

973 GRIFFON, ÉD. and MAUBLANC, A. **The Species of *Microsphaera* on Oaks and the Peritheela of the Oak Mildew.** (Les *Microsphaera* des Chênes et les périthèces du Blanc du Chêne). — *Comptes rendus de l'Académie des Sciences*, Tome 154, No. 15, (9 avril 1912), pp. 935-938. Paris, 1912.

France

From the researches made upon the systematic position of the various forms of *Microsphaera* known on *Quercus* throughout the world, the writers have adopted, for the present, the following conclusions:

1. The *Microsphaera* which attack oaks in America belong to two species, *M. abbreviata*, Peck, and *M. extensa*, Cooke and Peck, both of which are distinct from *M. Alni*.

2. It appears that these *Microsphaera* have, so far, not been found in Europe; the few specimens observed, up to the end of 1911, were probably *M. Alni* (found by Mayor in 1899 in the neighbourhood of Geneva, whose conidial form greatly resembles *Oidium quercinum*, Thümen), or belonged perhaps to a separate species (the specimen found in the Parma Botanical Gardens by Passerini in 1875).

3. The *Microsphaera* of the oak mildew does not seem capable of identification either with the American species as Arnaud and Foëx (1) think, nor with forms hitherto met with in Europe; it appears that this *Microsphaera* forms a new species, of unknown origin, very probably imported. The writers propose naming it *M. alphitoides*, Griff. and Maubl.

RESISTANT PLANTS.

974 SAVASTANO, L. **Gummosis of Citrus Trees prevented by Grafting on Bitter Orange Suckers.** (Il pollone di arancio amaro quale ricostituente nella gommosi degli agrumi). — *R. Stazione sperimentale di Agrumicoltura e Frutticoltura in Acireale, Bollettino* No. 7, 4 pp., 2 figs. Acireale, 1912.

Italy

New observations have proved the value of grafting upon bitter orange stock in making citrus trees more resitant to gummosis.

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(1) See *B.* March 1912, No. 576. (*Ed.*).

The aerial parts of citrus trees are attacked by "gummosis" and their roots by a rot. It has been shown that bitter orange used as a stock confers greater powers of resistance against both these diseases. For this reason the custom has been adopted of grafting nearly all citrus trees upon this species; the graft is made as high up as possible, to make it more efficacious.

MEANS OF PREVENTION AND CONTROL.

975

SAVASTANO, L. **The Results of Experiments made with Lime-Sulphur Mixture against certain Fungus Diseases in 1911.** (Risultati degli esperimenti con la poltiglia solfo-calcica, formola della Stazione di Agrumicoltura, eseguiti durante il 1911 contro talune crittogame). — *R. Stazione Sperimentale di Agrumicoltura e Frutticoltura in Acireale, Bollettino N.* 5, 6 pp. Acireale, 1912.

Italy: Campania, Liguria, Apulia, Sicily

The results of experiments made by the writer and others in Campania, Liguria, Apulia and Sicily with lime-sulphur mixture (the formula of the Royal Station for the cultivation of Citrus fruits) (1) as a fungicide, were at first to stimulate vegetative growth, this being a well-known property of sulphur, so that the leaves appear greener than before. The mixture had only a localized effect, that is, it only destroyed the fungus by contact in the same way as copper-lime mixture acts for vines. Hence the necessity of repeating the application, as soon as the fungus appears on parts not previously sprayed.

The lime-sulphur wash gives good results against numerous species of oidium and is often more efficacious than sulphur, notably in cases of severe infection of the vine.

For *Fumago*, it has not yet given definite results, though on the whole satisfactory, especially seeing that it also acts as an insecticide against some of the scale insects of olives and citrus trees, which often accompany *Fumago*.

It is not an efficacious remedy against rose rust (*Phragmidium subcorticium*). For successful use against mosses and lichens on olive trees, it will be necessary for the formula to be more exactly determined.

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(1) See *B.* April 1912, No. 753. (*Ed.*).

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

976 **Wart Disease of Potatoes imported into Newfoundland from Europe.** — *Dominion Experimental Farm Ottawa, Bull.* 63.

Owing to the shortage in the potato crop in 1911 dealers in and growers of potatoes have found it necessary to import large supplies for table and seed purposes from Great Britain, Ireland and other European countries. Bulletin 63 issued by the Dominion Experimental Farm, Ottawa, explains how Potato Canker (1) has found its way across the Atlantic into Newfoundland with potatoes imported from Europe.

Potato Canker is a disease at present unknown in Canada. It is one of the most serious diseases known, not only affecting the farm lands on which potatoes are grown but also being directly injurious to the health of the consumer of affected potatoes. Boiling does not destroy the injurious properties. The disease is characterized by nodular excrescences which may be often larger than the tuber itself. These cankers affect the eyes of the potato and are very small in the early stages. Any tubers found with smaller or larger outgrowths rising from where the eyes are situated should under no condition be used for seed or table purposes. The introduction and establishment of this disease would seriously compromise one of the most important agricultural industries of Canada, *viz.* Potato Growing. Farmers and consumers should be exceedingly careful in using potatoes that may have been imported from Great Britain or the Continent of Europe. Suspicious looking tubers should be destroyed by fire and not be thrown on the ground, or the disease, if present, will establish itself permanently in the soil.

The Bulletin referred to explains in detail the character of the disease and is available to anyone making application for the same to, H. T. Gussow, Dominion Botanist, Ottawa, Ont.

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(1) *Synchytrium endobioticum.* See *B.* Feb. 1912, No. 425. (*Ed*).

PAVARINO, G. L. **Bacteriosis of *Aster chinensis* L.: *Bacillus Asteracearum* sp. nov.** (Batteriosi dell'*Aster chinensis* L.: *Bacillus Asteracearum* n. sp.). — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Sc. fis., matem. e natur.*, Vol. XXI, 1° Sem., fasc. 8°, pp. 544-546. Roma, 1912. **977**

Italy: Pavia

The plants of *Aster chinensis* L. grown for ornament in the Botanic Garden at Pavia, were attacked last year by a disease which caused them to wither rapidly. The disease first made its appearance on the lower surfaces of the leaves in the form of scattered dot-like spots, which as they grew, became round or more or less elongated, depressed and of an ochre colour, and caused the whole leaf to become stunted and wither.

The infection spreads from the base of the plant to the summit, and attacks the flowers, which turn brown and wither like the leaves. The writer has been able to isolate, from the diseased parts, a microorganism which, from artificial infection experiments, seems to be the cause of the malady. As he believes it to be new to science, he has named it *Bacillus Asteracearum* sp. nov.

Fungi attacking Ginger in British India. — See above, No. 923. **978**

Summary of Recent Work on Plant Diseases, done in Bombay (Communicated to the International Institute of Agriculture, Rome, by the Director of Agriculture, Bombay). **979**

British India: Bombay

(1) By W. BURNS and G. B. PATWARDHAN.

Experiments have just been completed (March, 1912) for the third year on the treating of grape vine mildew (*Oidium*) by Bordeaux mixture plus soap (See *Bulletins* Nos. 36 of 1910 and 45 of 1911 of the Bombay Agricultural Department for records of first two years' work). On the basis of the three years' experiments we now recommend for grape vines in the Bombay Presidency five sprayings per annum, two of these, when the fruits are forming, to be half-strength. The effects of sprayings this year were, taken on the whole, that the number of mildewed bunches per plantation was reduced from 68.8 to 9.1 % and the number of mildewed berries per bunch from 12.5 to 0.8 %.

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(1) See *B.* Jan. 1911, No. 330. (*Ed.*).

These results are regarded as so conclusive that the grape vine cultivators are being urged to take up spraying extensively.

The above experiments were carried out by grape-growers who co-operated with the Department.

(II) By S. L. AJREKAR.

(1) The life history of *Cystopsora Oleae* Butl. on *Olea dioica* was worked out. It was found that the Uredo stage is completely dropped out from the life cycle of this rust.

(2) A rust on castor (*Ricinus communis*) has been studied, and a description is ready for publication. No other stage than the Uredo is known. None of the varieties ordinarily grown in the Bombay Presidency are immune. The disease is severe in the southern part of the Presidency and practically absent from Gujerat.

(III) By G. S. KULKARNI.

(3) *Tur* (*Cajanus indicus*) wilt fungus (*Fusarium udum* Butl.). In the Memoir issued on the subject by Dr. Butler the stem-form of this fungus was not fully studied. The stem-form has been isolated since, and it has been proved by inoculation experiments that aerial infection by spores takes place just as through the soil.

(4) *Sclerospora* on Jowar (*Andropogon Sorghum*). Only the oospore stage of this fungus was known previously on this host. The conidial stage has since been discovered and essential differences have been observed between the forms occurring on *jowar* and *bajri* (*Pennisetum typhoideum*) in the behaviour of the conidia in germination and inoculation experiments. These differences point to these forms being specifically different. The results of these observations will soon be ready for publication.

By S. L. AJREKAR and G. S. KULKARNI.

(5) « Koleroga » of Betelnut, caused by *Phytophthora omnivora*, var. *Arecae* Coleman (1).

An estimate was made of the probable loss from this disease in the North Kanara district. It amounts on an average to Rs. 900 000 per annum. Arrangements are being made for experiments with the spraying method recommended by Dr. Coleman of the Mysore Agricultural Department.

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(1) See *B*. Jan. 1911, No. 330. (*Ed.*).

DROST, A. W. " **Panama Disease** " (1) **of the Gros Michel Banana, caused by *Leptospora Musae*.** (De Surinaamsche Panamaziekte in de Gros Michel bacoven). — *Department van den Landbouw in Suriname, Bulletin* No. 26, blz. 1-41, Plaat 1-11. Paramaribo, Maart 1912. **980**

Surinam

The writer considers that the " Panama disease " (Panamaziekte) existed in Surinam before the introduction of the Gros Michel banana, and is an indigenous disease. It is produced by a Pyrenomycete, *Leptospora Musae.* The fungus is able to penetrate into the capillary roots of the host, from which it travels up the vascular tissue of the roots into the rhizome, and sometimes into the vascular bundles of the stems; but its chief point of attack is the vascular system at the point where the main stem gives off its branches, a little below the surface of the soil. It does not ordinarily attack the leaf-blades.

Besides perithecia, the fungus produces spores of the *Cephalosporium* and *Fusarium* types. Inoculations with pure cultures have given positive results.

The disease is easily spread in the plantations and from one to another by diseased pieces of plants and in soil. The fungus attacks various varieties of bananas, and can also live in the soil, where it finds very favorable conditions. Soil once infected cannot be used for growing Gros Michels.

Changes of moisture increase the susceptibility of bananas to the disease, while a moderate moistness diminishes it.

The different varieties of *Musa paradisiaca* are subject to the disease in very varying degrees: Bumalan, Congo, Pisang-radja and Almeido are almost immune.

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(1) See *B.* May 1911, No. 1549. (*Ed.*)

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

981 POLI, POLO. **An Efficacious Method for the Control of " Crodo " or " Selvatico " Rice** (1). (Un efficace metodo di lotta contro il riso " crodo " o " selvatico "). — *Il Giornale di Risicoltura,* Anno II, No. 5, pp. 69-71. Vercelli, 14 marzo 1912.

An experiment made last year at Valle Lomellina showed that sowing in drills is an efficacious manner of combating " Crodo " or " Selvatico " rice, which is a very harmful plant in rice fields.

Italy In an old rice field, usually infested by this weed, some of the ridges were sown in drills, while others, to serve as a control, were sown broadcast. In the case of the latter, all the weeds (*Cyperus, Panicum,* etc.) were removed, while in that of the former, all the plants which had grown between the rows were removed at weeding time without distinction, leaving those only which were in the drills and might be supposed to have been sown. It was found that, while on the ridges sown broadcast, the number of weeds was about the same as in preceding years, that on those which had been sown in drills was reduced to the few which had grown along the line and had not been removed by hoeing.

Sowing in drills gave a yield of Burma rice of 3 qls. per pertica, while from sowing broadcast, the crop was only one quintal per pertica of the same rice.

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(1) See *B.* Feb. 1912, No. 429. (*Ed.*).

INSECT PESTS

GENERALITIES.

The Second International Congress of Entomology. (Zweiter internationaler Entomologen-Kongress). — *Entomologische Zeitschrift,* Jahrgang XXVI, No. 5, S. 17. Frankfurt a. M., 4. Mai 1912. **982**

England

The Second International Congress of Entomology will be held at Oxford, from the 5th to the 10th of August 1912.

The first was held at Brussels in August 1910.

MEANS OF PREVENTION AND CONTROL.

Insectivorous Birds of New South Wales (1): **White-browed Wood-Swallow** (***Artamus superciliosus***) **and Fairy Martin** (***Petrochelidon ariel***). — *The Agricultural Gazette of New South Wales,* Vol. XXIII, Part 3, pp. 234-235, 2 pl. Sydney, March 2, 1912. **983**

New South Wales

In this part descriptions and illustrations are given of two birds which are very useful to agriculture in New South Wales, as they are deadly enemies to destructive insects. The birds are *Artamus superciliosus*, Gould, popularly known as the White-browed Wood Swallow and *Petrochelidon ariel*, Gould, the Fairy Martin.

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(1) See *B*. Jan. 1912, No. 258. (*Ed.*).

984 MOREAU and VINET. **The Control of *Conchylis*.** (La lutte contre la Cochylis). — *Le Progrès agricole et viticole*, 29 Année, Nos. 15, 16 and 17, pp. 461-470, 492-499 and 517-524. Montpellier, 14, 21 and 28 avril 1912.

France

It is clearly proved by all the experiments which have so far been made by the writers, that the liberal application of internal insecticides, at the right moment, is an efficacious treatment against the attacks of the first generation of *Conchylis*. Arsenate of lead is the best internal insecticide in the spring. Care must be taken to saturate the bunches with the liquid, and it is a good plan for the workers engaged in this operation not to treat the leaves at the same time, but to devote their undivided attention to the grape bunches.

The time of the treatment is very important, and is determined by the appearance of the moths, which is discovered by placing traps in the vineyard when the shoots are mostly 2 to 4 inches long. Two applications are then made; they ought to be carried out before the hatching of the larvae becomes general, but not long before, and always before the formation of the floral buds, that is to say, about four weeks after the first moths are seen.

The vine-grower should direct his efforts chiefly against the first generation, on account of the practical difficulties in combating the second. It is also well at the time of the sulphate or sulphur treatments, wich coincide with the flight of the moths, to add to the cupric mixtures or sulphur, insectifuge substances such as pyridine bases, or any other compound of known efficacy. The insecticide applications are, notwithstanding, the basis of the spring treatments.

The writers advise, should the spring remedies appear insufficient, or any fear be entertained of infection from neighbouring vines, that recourse should be had to insecticide powders, since there are practical difficulties in the use of liquid insecticides.

985 DECOPPET, M. **The Action of Carbon Disulphide on Cockchafer Larvae and on the Growth of some Forest Trees.** (Action du Sulfure de Carbone sur les vers blancs et sur la végétation de quelques plantes forestières). — *Procès-verbaux des séances de la Société vaudoise des Sciences naturelles*, No. 9. Lausanne, Séance du 17 avril 1912.

Switzerland

The writer has shown that carbon disulphide at the rate of 1 to 1 ½ oz. per sq. yd., injected into six holes at least, considerably diminishes the mischief done by the white grubs (cockchafer larvae). In his last experiments, M. Decoppet reduced the loss to 1-2 % in the beds thus treated, though it amounted to 20 % at the commencement, and 80 % in the untreated beds. The efficacy of carbon disulphide is therefore beyond doubt; the poor results recorded seem to be due to improper methods of applying it. This compound has also a favourable effect in stimulating growth of vegetation. This is shown not only in fatigued soils, but also in all others and in the case of all cultivated plants: it has an effect upon all agents causing lowering of productivity of the soil: insects in their different stages, eel-worms, infusoria, cryptogamic diseases, excretions of the roots, etc. There may also be an action of the sulphur, similar to that attributed to zinc, boron, and manganese, when used as catalytic fertilisers. Certainly the influence of carbon disulphide can be compared to that of a powerful fertilizer which increases the yield.

The writer concludes: 1. Application of carbon disulphide should become a regular practice in forest nurseries; it will not destroy all the white grubs in the soil, but will greatly reduce their number, thus permitting the plants to make new roots; and owing to the effect of the disulphide, the absorption of assimilable substances in the soil is increased, as is shown by the increased power of resistance possessed by the young trees. 2. The disulphide must be injected into the soil as uniformly as possible, at the rate of 1 to 1½ oz. per sq. yd., in 6 to 8 holes. Ground recently broken up should not be treated, and some days should elapse after the application of the disulphide before ploughing. Further, the soil must be neither too damp nor too dry. As the disulphide vapour sinks in the soil, it must not be injected to a depth of over 6 inches.

INSECTS AND OTHER INVERTEBRATES INJURIOUS TO VARIOUS CROPS.

Pests of *Hibiscus Sabdariffa* ("Roselle"), Fibre Plant of the Philippines. — See above, No. 917. **986 Philippines**

987 ZACHAREWICZ, ED. **Diseases of the Strawberry.** (Maladies du fraisier). — *Revue de Viticulture*, 10e Année, Tome XXXVII, No. 957, pp. 532-535. Paris, 18 avril 1912.

France: Vaucluse

The writer enumerates various pests of the strawberry plant, especially those which attack it in the Department of Vaucluse: *Oidium Fragariae*, *Sphaerella Fragariae*, ants, white grubs (cockchafer larvae) *Blaniulus guttulatus*, *Trombidium holosericeum*, *Tetranychus Fragariae*, slugs and wood and house mice.

M. Zacharewicz gives the most usual methods of combating these various pests, and says that in order to check strawberry diseases, it is necessary to obtain on the spot new varieties by crossing strong acclimatised plants and by adopting measures which will ensure the production of healthy resistant plants.

One very efficacious means to this end is the use of fertilisers with a base of potash and phosphates.

988 **The Brown Scale of the Gooseberry and Currant (*Lecanium persicae* var. *ribis* Fitch).** — *Board of Agriculture and Fisheries, Leaflet* No. 223, 4 pp., 2 figs. London, May 1909; revised, February 1912.

Great Britain

This insect is found in great abundance on the gooseberry, currant, rose, plum and cotoneaster, but rarely on the raspberry; it has also been found on a variety of other cultivated and wild plants.

It has a decided preference for the older branches, and is, as a rule, much more prolific on plants grown in sheltered spots.

It is very generally distributed throughout England, but is less known in Wales, Scotland and Ireland. There can be no doubt that this insect is a variety of the peach scale (*L. persicae*), differing only by its usually smaller size, its more rotund or hemispherical form, and the more marked character of the blackish, transverse bands in the immature stage.

Remedies and Methods of Control. This scale can be best controlled by winter and by spring washing; this must be thoroughly carried out, and it is advisable to complete pruning before spraying operations are commenced.

The best winter wash is the *Caustic Soda Wash* (Woburn Wash). This consists of:

Sulphate of iron	½ lb.
Lime	¼ »
Caustic soda	2 lbs.
Paraffin	5 pints
Water to make	10 gallons.

For spring washing Theobald recommends paraffin jelly made by boiling together 5 gallons of paraffin and 8 lbs. of soft soap, a pint of cold water being added during boiling. After stirring, the material is allowed to stand, and when cold, it forms a jelly. For spraying, 10 lbs. of the jelly may be used in 40 gallons of water.

MACDOUGALL, R. STEWART. **The Pea Moth (*Endopisa nigricana* Stph.).** — *The Journal of the Board of Agriculture,* Vol. XIX, No. 1, pp. 27-29. London, April 1912. **989**

Great Britain

This moth, which is known under the generic names of *Grapholitha, Tortrix, Laspeyresia* and *Endopisa,* and by the specific names of *nigricana, pisana, nebritana* and *proximana,* is well known in Central and S. Europe. It is found over Britain to Perthshire and also in Ireland.

The caterpillars of the moth live in the pea pods, and are the cause of the so-called worm-eaten peas. The harm caused is often considerable, and it is stated that a seriously damaged crop is only worth one half to three quarters of the price of a sound one. The moths fly at the time of the flowering of the pea; the caterpillars, when full-fed, leave the pods and creep a little way into the soil.

The caterpillar is destructive to both field and garden peas. One or two other leguminous plants have been named as possible host-plants, the seed in each case being sought while still forming in the pod.

The best time for combating the pest is when the caterpillar is in the soil for its winter rest. Thorough raking or deep hoeing of the soil, as soon as it is free from peas, would destroy many of the caterpillars.

The collection and burning of infested pods and the firming of the soil at the foot of the plants to hinder the entrance of the caterpillars has also been recommended.

" Dicky Rice " (*Prosayleus phytolymus,* Olliff.), a Pest of Fruit Trees. — *The Agricultural Gazette of New South Wales,* Vol. XXIII, Part 3, pp. 262-264, 1 fig. Sydney, March 2, 1912. **990**

New South Wales

An insect identified in 1895 as *Prosayleus phytolymus,* Olliff, and called locally " Dicky Rice ", causes great damage in New South Wales, especially to citrus trees.

It also attacks peaches and various other plants. Experiments as to the best means of combating this pest have been made since 1910. Spraying with arsenate of lead has proved very efficacious.

901 PICARD, F. **On the Presence of a Vine-Eating Caterpillar (*Cacoecia costana*) in the South of France.** (Sur la présence dans le midi de la France d'une chénille ampélophage, le *Cacoecia costana*). — *Le Progrès agricole et viticole*, 29e Année, No. 18, pp. 553-555. Montpellier, 5 mai 1912.

France

The three well-known Microlepidoptera *Conchylis*, *Eudemis* and *Oenophthira* (*Tortrix*) are not the only ones which attack the vine; there is a fourth species *Cacoécia costana*, less familiar to vine-growers because it is more localised, but which is quite as injurious an insect as the three first-named.

The first time its presence was remarked for certain upon the vine was in 1890, when Kehrig observed it in a vineyard in Gironde. More recently, the same species was observed by Schwangart in Germany, in the district of Bad-Dürkheim, where it was doing much harm.

This year, a fresh incursion of *Cacoecia costana* was witnessed by the writer in the Camargue, where it attacked the vines. The occurrence of this insect is not very rare, and, as in the case of *Eudemis*, can become more frequent under favourable conditions.

The full-grown caterpillar is 20-25 mm. (3/4 to 1in.) long, nearly the size of the *Oenophthira* larva. But it differs from the latter in its dark colouring; the colour, which is variable, is usually a dingy brown, passing from a greenish to a wine-like shade, the lower portion of the body being of a lighter tint. On the back and sides are longitudinal rows of white tubercles from which spring black hairs. The head and prothorax are of a glossy brown-black. This caterpillar, like that of *Oenophthira*, is very active, and wriggles at the slightest touch.

The chrysalis is black, and differs from that of *Oenophthira* in the replacement of the dorsal rows of spines by blunt tubercles. The moth is so like *Oenophthira* in flight, shape and size, as to be mistaken for it. But the fore wings of *Cacoecia costana* are furnished with two brown patches, one obligue and the other parallel to the costa.

The damage this insect does resembles the ravages of *Oenophthira*: the caterpillar devours the different parts of the vine and rolls up the leaves and young shoots by means of silk-like threads. *Cacoecia*, however, differs from *Oenophthira* in two ways: it attacks the vines much earlier, even at the beginning of April. The caterpillar appears as soon as the vine breaks, and reaches its full size by the end of April, at which time the *Oenophthira* larva is only a few mm. in length. Further, it has two female generations and the latter only one. The second brood of larvae appears towards the middle of the summer.

This larva is one of the most omnivorous known; it has been found on the following plants: *Arundo Phragmites, Cicuta virosa, Epilobium, Iris Pseudacorus, Lilium candidum, Nasturtium palustre, Rumex, Scirpus, Spiraea, Symphytum, Urtica, Viola, Comarum, Centaurea, Glyceria spectabilis,* etc. The only character which most of these plants possess in common is that of growing in damp situations; it would therefore appear that humidity is an indispensable condition for the existence of this species.

In spite of its omnivorous propensity, *Cacoecia costana* must not be regarded as an accidental parasite of the vine.

If it occurs more rarely than do *Oenophthira, Conchylis* and *Eudemis,* all of which are equally indiscriminate feeders, this is because it meets less frequently in vineyards the degree of humidity which is favourable to its development. Further, the vine-growers often confuse it with *Oenophthira.* Insecticides are of little use in destroying the caterpillars, which are always concealed in the buds or in spun-up leaves.

Hand-picking is, however, very useful; though the best method is scalding, as the larvae hibernate in the same manner as do the *Oenophthira* caterpillars.

MACKIE, D. B. **A New Coconut Pest.** — *The Philippine Agricultural Review,* Vol. V, No. 3, pp. 142-143, pl. IV. Manila, March 1912. **992**

Philippines

A new parasite, which is very destructive to the coconut palm, was discovered in the Philippines in May 1911, and named *Aleyrodicus destructor,* Quaint. The insect, soon after hatching, begins walking about on the underside of the leaf, which it perforates in order to suck the sap. Shortly before emerging as a winged insect, it stops feeding, but remains attached to the leaf. The presence of the colonies of *Aleyrodicus* is readily perceived on account of the white waxy substance which covers each insect.

Although there is a hymenopterous insect which is parasitic in, or upon, the immature *Aleyrodicus,* it is not likely that any nattural parasites will be of much avail in checking the spread of this pest. It is well, therefore, to cut and burn without delay all leaves which have been attacked. In some cases, spraying with kerosene emulsion is efficacious. Fumigation can be recommended only for extreme cases and then only for young trees.

903 PASQUINUCCI, G. **The Control of Processional Caterpillars on Pines.** (Un nemico dei pini e modo di combatterlo. [Risultati di vari anni di esperienze]). — *L'Italia Agricola*, Anno XLIX, No. 8, pp. 178-180, 2 fig. Piacenza, 30 aprile 1912.

Italy: Tuscany

The caterpillars of the processional moth (*Cnethocampa pityocampa*) are very voracious and destroy nearly all the needles of the conifers which they attack. Its ravages have been observed by the writer in the numerous plantations of *Pinus silvestris* in the district of Valdarno.

One characteristic of *Cnethocampa* is that the moth lays its eggs and the larvae make their nests, at all events in the district in question, upon low and young trees by preference.

This is probably due chiefly to the fact that the fermales, when about to lay, being heavy, find it difficult to fly high, and further to the predilection for tender leaves shown by the caterpillars, particularly in the first stage.

In the control of this insect, spraying with 8 % solution of sulphate of copper, without lime, has been found useful, but Signor Pasquinucci considers that the removal and burning, in winter, of the branches to which the nests adhere, is the most efficacious remedy.

904 **Uganda** ***Inesida leprosa*, Insect injurious to Castilloa Rubber Trees in Uganda.** — See above, No. 919.

RUGGERI ALFREDO, *gerente responsabile*.

INTERNATIONAL INSTITUTE OF AGRICULTURE

BULLETIN OF THE BUREAU OF AGRICULTURAL INTELLIGENCE AND OF PLANT-DISEASES

3rd YEAR - NUMBER 7

JULY 1912

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THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The International Institute of Agriculture was established under the International Treaty of June 7th., 1905, which was ratified by 40 Governments. Ten other Governments have since adhered to the Institute.

It is a Government Institution in which each Country is represented by delegates. The Institute is composed of a General Assembly and a Permanent Committee.

The Institute, confining its operations within an international sphere, shall:

(*a*) Collect, study, and publish as promptly as possible statistical, technical, or economic information concerning farming, vegetable and animal products, the commerce in agricultural products, and the prices prevailing in the various markets;

(*b*) Communicate to parties interested, also as promptly as possible, the above information;

(*c*) Indicate the wages paid for farm work;

(*d*) Make known the new diseases of plants which may appear in any part of the world, showing the territories infected, the progress of the diseases, and, if possible, the remedies which are effective;

(*e*) Study questions concerning agricultural co-operation, insurance, and credit in all their aspects; collect and publish information which might be useful in the various countries for the organisation of works connected with agricultural co-operation, insurance and credit;

(*f*) Submit to the approval of the Governments, if there is occasion for it, measures for the protection of the common interests of farmers and for the improvement of their conditions, after having utilized all the necessary sources of information, such as the wishes expressed by international or other agricultural congresses, or by congresses of sciences applied to agriculture, or agricultural societies, academies, learned bodies, etc.

The Institute publishes: (*a*) a Bulletin of Agricultural Statistics; (*b*) a Bulletin of Agricultural Intelligence and Plant Diseases;

(*c*) a Bulletin of Economic and Social Intelligence; (*d*) a Bulletin Bibliographique hebdomadaire (published every Saturday).

It has also published a volume on "The Organization of Agricultural Statistical Services in the Several Countries", and a volume on "Statistics of Cultivated Areas and of Vegetable and Animal Production in the Adhering Countries" (an Inventory drawn up from documents published by Governments), and "Monographs on Agricultural Co-operation in Various Countries (2 Volumes)".

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The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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AGRICULTURAL INTELLIGENCE

NB. The Intelligence contained in the present Bulletin has been taken exclusively from the periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of May and June 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

Exemption from Import Duty on Agricultural Machinery and Seeds in the Republic of Uruguay. (Exención de derechos à la importación de maquinarias y semillas para la agricultura). — *Revista de la Asociación Rural del Uruguay,* Año XLI, No. 4, pp. 303-304. Montevideo, Abril de 1912. 995

The General Assembly of Uruguay approved on January 9, 1912, the following decree:

The Senate and Chamber of Representatives of the Republic of Uruguay united in General Assembly decree: **Uruguay**

Art. 1. — The Executive is empowered to exempt from import duties all machinery to be used in industries depending upon live-stock breeding, agriculture and allied branches.

Art. 2. — The Executive is empowered to import duty-free seeds in general, destined for sale, for which the sums voted by the Law of June 2, 1906, for the purchase of seed wheat, may be applied.

The Executive is likewise empowered to grant permits for the duty-free importation of seeds, under the Regulations to prevent them being used for industrial or commercial purposes.

Art. 3. — Twine for reapers and binders is duty free.

Art. 4. — The Executive will draw up Regulations for this Law.

996 France

Draught of Law concerning the Organisation of Technical Agricultural Education in France. — See below, No. 999.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

997

RATHGEN. **German Colonization.** (La Colonisation allemande). — *Revue Economique Internationale,* Vol. II, No. 1, pp. 96-117. Bruxelles, 15-20 avril 1912.

German Colonies

The German colonies both in Africa and on the Pacific are in the tropics. The African colonies are in the same zone as the Belgian Congo. Their climate, soil and flora are similar. Also, access to the south of Kamerun is obtained not from the German coast but up the Congo, Oubangi, and Sanga rivers.

The principal question which concerns the German colonies is that of the utilisation of their new districts with their virgin soil. It is a question of increasing the production of the raw materials for German industries. The value of the export trade of the Colonies of tropical Africa has increased since 1903 by about £1½ million, of which about half is brought in by rubber and a sixth by oil plants, the consumption of which increases yearly.

The results as regards textile materials are not so rapid, but would be satisfactory if a portion even of the amount required by German industries was supplied. This will be attained by methodical and continuous work; and by reducing the fluctuations of the market the progress of the great German industry will be more regular and the employment of the workmen more secure.

It is necessary to perfect economic machinery in the colonies. Already Germany possesses about 4000 km. (2400 miles) of railways, either at present in working, or to be opened shortly.

With the exception of S. W. Africa, the German colonies are not thickly populated. Consequently the problem of the two races is a difficult one — the adjustment of the claims of the white emigrant and the native.

The question of white emigration is not however in tropical countries, as in temperate lands, an economic problem, but one especially of biology and hygiene. The white colonist does not wish for the extermination of the blacks, but rather laments the small number available for agricultural work. Where the labourers are coloured, white labour cannot immigrate. In tropical colonies, the white colonists are obliged to employ natives and must be provided with some capital.

They have to produce goods to be sold on the world's markets, *i. e.* goods which can be exported. Gradually the small colonist becomes transformed into a large planter. On the slopes of Kilima Ndsharo, the colonists have become coffee planters with plantations of 125 or even 250 acres. White colonisation everywhere where there are natives, in mixed colonies, is based upon cultivation on a large scale, which on the other hand, is a question of labour.

In large plantations, and even in average-sized, we see co-operative effort, in the form of Agricultural and Commercial Societies, replacing individual enterprise. The towns will thus become the centres of power in the colonies in the tropics with native populations, also where the population is not very concentrated.

The rule of the white man will be subject to the same difficulties one day in tropical Africa as it encounters to-day in Egypt, Algeria, India and the Philippines.

The progress of the German colonies was at the beginning very slow; it is only during the last seven or nine years that it has been more rapid; but this progress will certainly continue. The simplest and surest measure of this advance is always economic progress, and economic power in the colonies shows itself in the amount of external trade.

The foreign trade of the German colonies of tropical Africa in 1892 was worth a million pounds, and in 1903 it had increased to 1 $^3/_4$ millions.

RURAL HYGIENE.

Precautions against Malaria in Argentina. (La lutte antipaludique en Argentine). **998**

1* PENNA, JOSÉ. Plan de prophylaxie antipaludique.

2* RETAGNO, A. Rapport de la Mission d'études dans les régions palustres de l'Argentine.

3* Législation antipaludique en Argentine. — *Office international d'Hygiène publique. Bulletin mensuel,* Tome IV, No. 4, pp. 628-642. Paris, avril 1912.

Argentina

1*. — Prophylatic measures against malaria fall into two groups: internal remedies (the taking of quinine) and external measures (the destruction of the mosquitoes and their larvae, and the drainage of marshy ground).

The preventive administration of quinine only ensures immunity at the time when the medicine is taken. To administer it continually is difficult in practice; further the bitterness of the drug causes, after a continual and prolonged use, an instinctive repulsion, which renders impracticable its exclusive employment. During two years of the preventive administration of quinine 1 million pesos (nearly £200 000) have been expended in Argentina on the payment of the staff entrusted with the distribution of the drug; the results, however, have been very unsatisfactory.

On the other hand, the campaign against the mosquitoes and the drainage of marshy ground require an efficient organisation and considerable outlay.

The case of Santiago del Estero shows that, if recourse is had to external prophylactic measures alone, the evolution of disease is, at first, not much affected; but the drained zones are new sources of agricultural wealth. Therefore a system should be adopted, which includes preventive administration of quinine and making the districts more healthy.

According to Dr. Penna, the President of the National Department of Hygiene, the sum set apart by law is insufficient to accomplish this twofold purpose and it would be best to limit the sphere of action, concentrating the efforts made upon one or two Provinces, instead of extending them to the immense areas which are in need of prophylactic measures.

The writer summarizes the measures to be taken this year by the Department of Hygiene, as follows:

1. Destruction of hibernating mosquitoes by means of sulphur dioxide or by fumigation with pyrethrum at the rate of 1 oz. per 100 cub. ft. For this purpose, disinfecting parties provided with all the necessary appliances will be used. This system has already given excellent results at Rio Janeiro and Panama. The mechanical protection of dwellings in marshy districts will be effected in a permanent manner.

2. Measures for the destruction of larvae. These will be carried out by parties sent out every day for the purpose of applying petroleum to, or drying up and draining off, water which has collected. In cases where petroleum cannot be used (where the collected water forms necessary reservoirs) recourse must be had to fish, or to the introduction of duckweed, certain ferns etc., plants which are known to hinder mosquito development.

The measures recommended by Dr. Penna are as follows:

1. Exact statistics of the morbidity and mortality due to malaria.

2. In addition to sanitary precautions, the following must be enforced: *a*) preventive administration of quinine (from November to May) no less than the therapeutic administration of this drug (which can be carried out throughout the year); *b*) affixing of wire netting to all houses, especially to those in chief towns with a native population; *c*) pouring of petroleum upon such stagnant waters as are not used for irrigation or for watering animals, and especially on brick-ponds; *d*) fumigation of certain houses in populous centres, with the view of destroying the adult mosquitoes; *e*) establishment of sanitary stations to help in the prevention of infectious diseases.

4. Drainage of the soil.

5. The organization of services for the assistance of the sick and for the distribution of quinine. In each Province there will be a head doctor, who will be intrusted with the direction and superintendence of the anti-malarial campaign, and who will place himself in communication with the provincial and communal authorities, for the purpose of obtaining their co-operation.

The provinces will be divided into zones, each under the care of a doctor, whose duty it is to travel over the district for which he is responsible, at certain dates, and to superintend the anti-malarial dispensaries.

In each of the malarial provinces, a laboratory will be founded, for the purpose of studying the question of prophylactic measures and for the diagnosis of infectious diseases.

2*. — The report gives an account of the factors of malaria in the provinces of Catamarca, Tucuman, Salta and Jujuy. They are divided into natural factors (temperature, luxuriance of vegetation, clayey nature of the soil) and artificial factors (the situation of the towns and villages in proximity to streams, uneven ground, brick-ponds, etc.). The drainage of these districts must include:

1. The formation of a system of drains by which the stagnant water can run off continuously.

2. The regulation of the slopes near streams in the zones inhabited by *Anopheles* near groups of houses.

3. The mechanical protection of dwellings and fumigation at least of those in towns and of railway-stations.

4. The pouring of petroleum upon stagnant water, with the exception of the many cases where the petroleum might be injurious for cattle-raising and agriculture.

5. The removal of brushwood from the neighbourhood of small ponds.

6. The levelling of excavations and surface irregularities. This is only practicable within a small radius in the neighbourhood of towns and railway-stations.

7. The construction of wells with buckets or semi-artesian, in districts where the water is unwholesome.

The formation of draining-wells to take up the water from a marshy slope does not seem a practicable or economical measure.

The work of the improvement in the sanitary conditions can be well summarized if a table is drawn up for each town, village, farm or establishment, on which is set forth the nature and extent of the drainage operations, the method and date of their execution, the material assistance rendered, directly or indirectly, by public institutions, or due to individual initiative.

3*. — According to the Order of July 1911, supplementing law No. 5195, the Governments of the provinces affected by the law must recognise the immediate right of intervention possessed by the National Department of Hygiene and the centralization of the directing action of the antimalarial campaign.

The sanitary services of these provinces will co-operate with the staff appointed for the National Department of Hygiene in carrying out the approved measures.

A medical director will be appointed for the superintendence and control of prophylactic measures in the provinces of Tucuman, Salta, Catamarca and Jujuy.

Owners of property possessing expanses of water and ponds situated in inhabited zones will be required to drain and sterilise these within a radius of one kilometer (nearly two-thirds of a mile) from dwellings, except in the case of drinking water, or with the express permission of the Director of the Services.

Railway and other companies which are compelled to make large excavations in malarial zones, will be required to prevent the collection of stagnant water within 5 km. (3 miles) of inhabited houses.

Railway and industrial companies will be held responsible for the permanent mechanical protection of the houses of their employees, as well as of the workshops and places where the work is carried on.

Permanent and travelling staffs under the direction of technical assistants will be appointed for drainage and application of petroleum.

Larvicides and quinine will be supplied by the Department of Hygiene.

Gratuitous medical assistance will be given to persons suffering from malaria, and these will be exempt from all work.

A register will be kept of all chronic malarial patients in each department. Notification of cases of malaria is compulsory.

The Regulations of the anti-malarial service provide entirely for the expenses of the district medical-directors, the zonal doctors, the sanitary corps and those of the antimalarial dispensaries.

The Regulations concerning culicicide and larvicide remedies (approved by the President of the National Department of Hygiene on August 29, 1911) contain detailed instructions respecting the organization of sanitary corps and of bands of disinfectors and the destruction of mosquitoes and their larvae.

EDUCATION IN AGRICULTURE AND FORESTRY. — AGRICULTURAL EXPERIMENTATION.

THE ORGANISATION OF TECHNICAL AGRICULTURAL EDUCATION IN FRANCE.

(OFFICIAL COMMUNICATION).

999 M. Louis-Dop, delegate of France and Vice-President of the Institute, has laid before us, in the name of the French Government, the following official communication relative to the organization of Professional Agricultural Education in France.

The draught of the law referring to it, which has been presented in the name of M. Fallières, President of the French Republic, by M. Pams, Minister of Agriculture, M. Guisthau, Minister of Public Instruction and of the Fine Arts and M. Klotz, Minister of Finance, has been elaborated and prepared by the Direction of Agricultural Instruction of the Agricultural Services of the Ministry of Agriculture of France, under the supreme direction of M. Berthault, formerly Professor at the National School of Agriculture of Grignon.

Agricultural Instruction.

Since the beginning of this century, all nations have made considerable efforts to develop and bring to perfection agricultural instruction in their respective countries. **France**

France has not remained aloof from this movement, and if we examine the system of higher education there, or only the elementary teaching, and the primary instruction of the young of both sexes, everywhere we see traces of the foresight of our predecessors in devising measures calculated to bring our agricultural institutions into harmony with new requirements.

We are however forced to recognized, if we review the organizations which have been set on foot in other countries, that from one or the other point of view, we are outstripped by the nations that surround us. In view of the decreasing population of the country districts in a land which, like our own, derives its chief wealth from agriculture, it is necessary to delay no longer the organization and perfecting of our system of agricultural instruction.

We repeat, that much has already been accomplished; but the evolution of modern societies, which modifies the economic conditions of production, the necessity, in a democratic country like France, of ensuring professional education for all classes of the community, and under the conditions best adapted to the different environments, requires a remodelling of our systems of instruction, a coordination, which it has hitherto been impossible to realize on account of the embryonic conditions of the important work under discussion.

Parliament has also, this year, shown clearly, on the occasion of voting the Agricultural Budget, its desire to take part in the various schemes projected. It has expressed its opinion as to the necessity of establishing continuation courses, of organizing winter schools, of developing economic teaching, for which it voted special credit, and of the advisability of improving agricultural schools. These efforts can only be attended with success if the teachers in each of these educational establishments are well trained for their work. It is necessarily the part of a special section in our National Agricultural Schools to supply such professors, who on their side must give suitable up-to-date instruction to agriculturists. But this last objective demands more and more the existence in our schools of facilities which are at present wanting.

It is the means of applying instruction in a practical manner which are needed. Suitable establishments grouped around our large schools, with the use of their laboratories and apparatus, will be of assistance alike to farmers' sons, who will here obtain the practical instruction indispensable for those engaged in industrial agriculture, and to such agricultural graduates as wish to become professors; while the expenses of installation and of subsequent upkeep will be relatively reduced.

Certainly, this plan can only be realized by degrees; but this only renders its immediate adoption the more pressing. Every possible subsequent improvement will fall into its place in the whole structure, in the same manner as, in a well-planned building, each stone finds its appointed place. Useless expenditure will thus be avoided; isolated establishments, which have no place in a harmonious whole, and which have been a serious hindrance to the advance of instruction, will no longer continue to bar the path of progress.

The problem of Agricultural Instruction in France is as follows: *We have a million young countrymen belonging to different classes of society; about 2 500 of these are divided among our different establishments. How is it possible to ensure the benefits of agricultural instruction to all? We have also about a million country girls. How can these be well trained in agriculture and house-hold management*?

I. — Instruction of Young Men.

HIGHER EDUCATION.

1. — *National Agricultural Institute.*
2. — *National Agricultural Colleges.*

For talented young men, who wish to devote themselves to scientific research, to the great agricultural industries, to teaching, or to farming on an average or large scale, there are the National Agricultural Institute and three National Agricultural Colleges (Grignon, Montpellier and Rennes) where they can receive a complete course of education. " But ", says M. Fernand David, in his report on the Agricultural Budget, " these colleges suffer from a kind of indisposition.... Under these circumstances it is perhaps worth considering if it would not be well to make changes in all these colleges which were originally founded for a different object, which are deficient in one or another respect, and which are jealous of one another, and to encourage them to support oneanother ".

It must be recognized, that, so far, the Agricultural Institute has not played the part of a polytechnic school of Agriculture allotted to it by its founders, for it had not the necessary practical schools. Further, it was without Schools of Forestry and of Horse-Breeding, Brewing, Sugar-refining, Distillery, Dairying, Poultry-keeping, etc.; and finally, there was no model school for training instructors.

Our National Colleges suffer in like manner from the absence of industries attached to the farm. It is necessary for the students to have, in addition to agricultural instruction, and an ordinary farm, industrial organisations, which correspond to the special cultural conditions of the districts where they will work. Agriculture in France becomes more industrial every day; the importance of machinery steadily increases; the students of our large schools must partake in this agricultural and industrial life.

The object of the Commission on Higher Education, the eminent members of which have devised the first part of the draught of the law (National Agricultural Institute, the National Colleges of Agriculture) is as follows:

To complete our National Institute of Agriculture, so that it may be the organ of true higher instruction; to allow the young agricultural graduates, on leaving it, to find themselves in an environment where they can finish their technical education, and specialize in their studies, using for this purpose our different National Agricultural Colleges, while leaving to the latter their definite rôles and special characteristics; to make arrangements, by the help of which these schools can render one another mutual assistance, and share each others' interests.

This project gives roughly the scheme of the reform of our higher education; it forms an advantageous bond between the National Agricultural Institute and the National Colleges; it completes the work of making the Agricultural Institute into a Polytechnic School of Agriculture.

Under the new arrangements, the students will, as now, study for two years at the Institute. During this time they will work at chemical, physical and natural sciences applied to agriculture. At the end of these two years, they will specialize in the following manner:

1. For the Woods and Forests and for Agricultural Improvements, they will proceed to the College of Forestry.

2. For Horse-breeding etc., to the College of Horse-Breeding.

3. For Agriculture, Agricultural Industries, Professorships (teaching professorships) they will go to the National Colleges of Agriculture, and to the particular section required.

The higher normal section of the National College of Grignon, for example, will consist of:

a) A series of autonomous colleges, for brewing, distilling, dairying and cheese-making, etc., under the actual management of the College.

At Grignon, the dairy and cheese-making schools and those for poultry-rearing and bee-keeping are nearly complete; the staff is adequate, and it only remains to finish the instalment of the apparatus, etc.

b) A model farm.

c) A College of Practical Agriculture for the training of the lecturers.

All the Colleges of Agricultural Industries will be actual organizations of experimental industries, capable of furnishing, to such as require them, information as to the causes of the frequent faulty output of our different factories. The chief defect in our professional schools is that they consider application and practice merely as an illustration of this course, which is considered almost everything; thus the Agricultural Industrial Schools are not living realities and are not frequented by the sons of farmers, because they cannot turn out will-equipped practical agriculturists.

We wish to follow the example of the North European countries (where the professional schools are really practical and very successful) and collect around our national schools the different agricultural industries, where the students will actually learn the practical part of their work, instead of confining themselves to the theoretical side; for the courses will consist of the explanation of the practical work. This organization will realize the intimate union of theory and practice; these explain and complete one another.

Our colleges will become agricultural universities provided with all the means of instruction which modern professional education requires.

We are persuaded that the number of students will soon become, relatively speaking, very large: not only will students from the Agricultural Institute be admitted, but also regular students and such unattached persons will attend from outside as need to study one special subject only.

The model farm will be the present farm at Grignon, whither the students, other than future lecturers, will come to learn the practical agriculture necessary for the management of a farm, to apply scientific data to cattle-feeding, to control or organize labour, and to manage agricultural machinery.

The Model Practical College of Agriculture, which completes the whole, will provide instruction in the art of teaching for the future lecturers of the practical colleges and also for such agricultural lecturers as have, in addition to their administrative functions, to lecture at the Normal College, the Secondary School, the Higher Primary School, the Winter School, etc.

This College has been in request for many years. In 1904, M. Mougeot foresaw its existence and recognized that its establishment was the chief point in the reform of our Colleges of Practical Agriculture. M. Fernand David, two years ago, in his report on the Agricultural Budget, advocated its speedy formation, remarking that the training of professors, " if not the only remedy for the indisposition from which our Colleges of Practical Agriculture are suffering, is at least the first and most efficacious ". It is only surprising to see how long it has taken for the recognition of this truth, which appears indeed self-evident, *viz.* that the profession of lecturer, like every other profession, must be learnt, and that a learned man is not of necessity a good teacher.

A Higher Normal Section, like that which will be founded at Grignon, and which we have taken as an example, will also exist in the National Agricultural Colleges of Montpellier, and of Rennes. At the former place it will devote its attention to wine-growing and wine-making, to studies of southern crops and, further, will include a Colonial School or section. At Rennes, it will include a school for cider-making, a dairy school, one for fruit-growing, and one for drainage and irrigation, etc.

The National Colleges, far from losing by the projected organisation, wil lcertainly benefit by it, for we propose an addition, not a substitution. Further, the National Colleges will retain their present recruiting area, they will continue to be attended by the sons of farmers, who having left School or College, are desirous of acquiring the necessary knowledge for the management of their properties; also as in the past by the promising students of the practical schools, who contemplate becoming agents of large estates.

They will accept " bacheliers " without examination and, as far as space will permit, also foreigners possessing equivalent diplomas (1). The total number of these students will form the *Agricultural Section*, which will be distinct from the *Higher Normal Section;* but can use for purposes of instruction all the organization of the latter. The course of study in the Agricultural Section will be two years instead of two and a half.

As it is fair and democratic not to exclude from the benefits offered by the Agricultural Institute the best students of the National Colleges, who are often former students of the Practical Schools, 30 competitive places have been reservéd for them.

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(1) That is " matriculation " standard of the American and newer English universities. (*Ed.*).

Two years in the Agricultural Section, two at the Agricultural Institute and, finally, one year in the Higher Normal Section, will not be too long a course for this class of student, since the average age of admission to the National College is about 17, while students enter the Agricultural Institute usually at 19 or even 20. Moreover, it should be observed that those students of our National Agricultural Colleges who wish to rise to administrative posts, to departmental professorial chairs, to posts at research stations, are often obliged to pursue their studies under conditions most trying to themselves and very unfavourable to their chances of success. We shall, by the above scheme, spare our talented young agricultural graduates of slender means the hard years of preparation and shall make easy for them the entrance to the career of their choice. They will find at the Agricultural Institute first, and later in the Normal Section of the Agricultural Colleges, all the facilities for thorough preparation.

But if a longer course of study is required of these young agricultural students, it is only fitting that State posts (Professorships of Practical Schools, Agricultural Professorships, Assistant Professorships and posts of Demonstrators at the National Agricultural Institute and our National Colleges) should be reserved for them. Further, as in order to teach even a little, much knowledge is necessary, the members of the staff must give indisputable proof of having been well instructed, and those alone who have attended the Higher Normal Section are competent to do this.

As will be seen, the proposed scheme does not oblige all students desirous of entering the Agricultural Institute to pass through the National Colleges (it does not apply to the training of foresters and of engineers for agricultural improvements). The National Colleges are not to be regarded as Practical Schools of the Agricultural Institute, for this would mean the ruin of the former. What we suggest is, rather, a compromise, due regard being paid to the interests at stake, which must be all equally safe-guarded. The sacrifice of any one of our present organizations of agricultural instruction for the benefit of the others would be a miserable solution, which, far from making for true progress, would curtail our means of agricultural development. The reform described above would replace discord by harmony and undoubtedly raise the level of higher instruction.

Assuredly this plan cannot be realized tomorrow in its entirety;

but it can be rapidly carried out by utilizing the resources of the National Schools, the scope of which will be enlarged.

And we have the sure conviction that this course once embarked upon, its success will so soon be apparent, that our Institutions will speedily be provided with the organization which is now lacking, and that they will, without loss of time, rapidly expand in the direction which has just been pointed out.

Moreover, it must be remembered that the projected reform of our higher teaching institutions, which may *a priori* seem somewhat sweeping and which places many accessory questions at stake, governs all reform in the instruction given in the Practical Schools in the organisation of departmental instruction, as well as all continuation-school and economic teaching. Success in the different branches of learning can only be attained by the training of competent instructors.

The Professors of the Practical Schools should have, in addition to their scientific training, a special preparation, for without this, as we now find so often to our cost, they are unfitted for their task. The departmental professors of agriculture are, likewise, in need of this special training, if they are to be fit to prepare the teachers for their new work.

The National Agricultural Institute, completed by the National Colleges, will realise this aim, and, as has been said above, the students of these schools will benefit at the same time by the organisation when realised, and the area from which the students of the agricultural establishments are drawn will be enlarged and improved.

It is indispensable, if the full effect of the suggested measures is to be obtained, that the National Colleges shall be chosen for the training of teachers.

Any other arrangement, which should exclude these schools from the general organisation, would only lead to an unsatisfactory and incomplete result. The antagonism between our National Agricultural Institute and the National Schools would continue, to the great prejudice of learning and of the wise use of the resources provided by the budget.

INTERMEDIATE EDUCATION.

1. — *Practical Agricultural Schools.*
2. — *Farm - Schools.*

For the sons of small proprietors and of farmers, we have practical schools called " Technical Agricultural Schools ". They are for the purpose of receiving youths, who on leaving the Primary Schools, Higher Primary Schools or Secondary Schools, wish to acquire professional agricultural instruction.

These Schools come midway between Farm Schools and the National Agricultural Colleges and their aim is to turn ont enlightened agriculturists.

The course is from 2 to 3 years.

The students' time is divided into two parts: half the day is devoted to cultural work, care of the animals, the management of machines, gardening, etc. and the other half is reserved for lessons, study, laboratory practice. Overdoing either mental or physical work is thus avoided.

The typical practical agricultural school, when properly understood, is the ideal type of school for those who wish to have a certain amount of agricultural instruction and who can devote two or three years to it. This system has answered very well abroad, and if the results in France have not been so satisfactory, this is due to the fact that important reforms are necessary in organisation and in the programme of instruction. As soon as some of our present practical schools become really prosperous, we should necessarily, by means of judicious changes, obtain satisfactory results from the whole.

The reform of higher instruction will have a good effect upon our intermediate instruction, since it will entail, as already mentioned, the training of the lecturers of the practical schools and of the agricultural professors, in the art of imparting instruction, together with the practical training of the teachers, who will be able to apply their knowledge practically at the model farm and in the schools of agricultural industries.

The posts of the professors will be obtained by means of a competitive examination, similar to that required of the special professors of agriculture; thus all the staff will be on the same footing and will allow of the spreading of the outside influence of our schools. Germany, Austria, Italy and Hungary have developed their schools of practical agriculture. All these countries, as well as England and America, have thrown their schools open to the farmers of the district, and thus they not only serve for the instruction of their own students, but become *Agricultural Centres.* We shall thus increase the scope, hitherto so limited, of our practical schools, which now are isolated and only occasionally come into touch with the general public. The lecturers, in addition to their regular courses, will hold conferences with the farmers of the district, under the direction of the departmental professor and with the permission of the Director of the school. A committee will be appointed in each school for the purpose of providing the public with gratuitous advice. Most of our practical schools will have annexed a Winter School and a short Housekeeping or Dairy Course for girls during one month of the long vacation. In each establishment, there will be reduced courses for adults (courses of fruit-tree pruning, grafting, courses of instruction in preserve-making, etc.).

For the children of the labouring classes, there are farm schools organized under the laws of Oct. 3 1848 and July 30, 1875. The scholars are regarded as working apprentices; they do all the work and receive, in addition to essentially practical instruction in agriculture, a sum on leaving (not exceeding 300 fr., £12) graduated according to their position in class.

In 1848, there were 70 Farm Schools in France, but since then their number has gradually decreased; in 1870 there were 52; in 1894, 16 and at the present time, only 10 remain. The disappearance of these schools is chiefly due to the very reduced amount of theoretical instruction they provided, which was practically negligible; three quarters of the time were entirely taken up by purely manual cultural work. The farmers no longer therefore cared to send their children, for though the instruction was at first well adapted to the requirements of the country, it has now become insufficient; agriculture has become more systematized and more scientific, and agricultural instruction has had to develop along the same lines. The ten Farm Schools which remain and are very efficient have only survived through raising the level of their teaching and by becoming more like Practical Schools. The same thing has happened in all foreign countries where Farm Schools existed; they have either disappeared, or been transformed into Practical Schools. Farm Schools and reorganized Schools of Practical Agriculture will be known under the same title of *Technical Agricultural Schools.*

3. — *Winter Agricultural Schools.*

The Winter Schools, so much appreciated in other countries, are to be increased. They are attended by the sons of small farmers, who cannot spend two or three years in a Technical Agricultural School, because their parents require them during the summer.

Germany possesses more than 300 of these Winter Schools, Austria (not counting Hungary) 57, Switzerland 9, and Holland 10.

Attempts in this direction have been made in France, where there are already 9, and from the success of the experiments in this line, it is evident that such schools will be much appreciated.

It is now necessary to give the regulations for the founding and organisation of these new schools. The period of instruction has been fixed for 3 or 4 months per winter (November to March) for two winters. The staff, as a rule, will include: a director, who will give instruction in agriculture (including elementary instruction concerning agricultural machinery, rural buildings, rural economy and legislation, the agricultural industries of the district, such as dairy work, wine- and cider-making etc.); a lecturer in physical, chemical and natural science applied to agriculture; a veterinary surgeon to teach the care and management of farm animals, hygiene etc.; an instructor for gardening, fruit-growing and vegetable-growing; an instructor in land-surveying, levelling, agricultural book-keeping and French.

It is the lecturer in agriculture who should have charge, not only of the agricultural instruction in the Winter School, but also of the direction of the whole. His presence is likely to ensure a good attendance, in a district of which he should know better than any one else the needs and aspirations.

Winter Schools can only be started by the Ministry of Agriculture and in places where a sufficient technical staff can now be maintained. The collaboration of the Ministry of Public Instruction is, however, indispensable. The financial expenses of founding the school are easily met by using the premises of the Schools of Public Instruction and by the help of some of their masters and instructors.

The collaboration of the two Ministries has been effected. As the sole ambition of both was to serve the democracy by instructing the rural population and consequently ministering to the economic good of the country, it is certain that complete unanimity will always exist between the two departments as regards their common goal. Further, according to our draught of the law, when the Winter Agricultural Schools are located in buildings belonging to the Ministry of Public Instruction, the Director nominated by the Ministry of Agriculture will only be *Technical Director* and will only concern himself with the teaching. Everything concerning the administration (board expenses, superintendence of the school, etc.) will be placed under direction of the Chief of the University Buildings and under the control of the Ministry of Public Instruction.

Boys are not admitted to the Winter Schools till they are fifteen and a half or sixteen and till they have worked two or three years at practical agriculture, as is the rule in Germany, Austria, Hungary, Switzerland, Holland and Denmark.

In the experiments which we have made, it has proved that those boys who before their admission to the Winter Schools have done most field-work, are the ones who assimilate best the instruction given. In Holland, it has been shown that the pupils must not be too young or ignorant of practical work. By this means, the Winter Schools will not be the rivals of the Practical Schools, as they meet the requirements of a different class of pupil. It is the general opinion in France that Winter Schools should replace Practical Schools; this is a mistake, which is not made in other countries, where both types of school exist and flourish side by side.

II. Instruction of Girls.

INSTRUCTION IN HOUSEKEEPING AND AGRICULTURE.

We should consider that we were neglecting our duty if attention were not paid to female instruction. Woman's work on the farm is so important and her influence in keeping a man settled on the land so great, that it is indispensable that girls should be provided with an education parallel to that which the boys enjoy. The professional education of girls seems to be a social necessity for the interests of the whole community.

We have at the present time only 3 practical schools for girls and only 15 travelling housekeeping schools, while there are in Germany 48 housekeeping schools. Belgium possesses one higher school and 20 stationary or travelling housekeeping schools. Luxemburg, with its 245 000 inhabitants, has 15. If France, with its 37 million inhabitants, had as many in proportion, the number would be 2 265, and for Germany the same proportion would give 3 000.

With the credit voted by Parliament we wish to found:

1. *Stationary and Travelling Housekeeping Schools* corresponding to the travelling Winter Schools for boys.
2. *Tempory Stationary Schools* corresponding to the boys stationary Winter Schools.
3. *Technical Schools of Housekeeping and Agriculture* corresponding to the boys' Practical Agricultural Schools.

But a select staff is required for all these new schools, which can only be trained in a special Higher School. In order to avoid the large expense involved in the founding of such an establishment, it has been decided to make use of the National School of

Agriculture at Grignon. To this girls provided with elementary certificates will be admitted after a competitive examination, for a preliminary period of three months (from July 15th to Oct. 15th. when the men are away for their holidays). After this, follows a nine-month period as pupil-teachers in already existing housekeeping schools, during which time they will follow a practical programme of studies, which is clearly defined, at the end of which time the girls will return to Grignon for the third and last period of three months. The duration of the course will be one year and a half, which is long enongh, as the general education of the pupil teachers has not to be considered.

Besides those students who aspire to professorial posts and who will form the *Normal Higher Section*, such agriculturists' daughters as, later on, will have the management of large estates, will also be admitted as being suitable and helpful companions for the other students.

The men's National Agricultural Schools (Grignon, Montpellier and Rennes) will thus be used during the vacations as Higher Schools of Housekeeping and Agriculture for women, thus avoiding all the large preliminary expense of building and fitting up. The only outlay will be the salaries of the staff. The women lecturers employed in these schools will be used as inspectors between the two terms of three months.

Further, we shall apply to nearly all our agricultural schools the system of schools with two objects, which obtains in other countries: Wherever it is possible, the boys' practical schools will, during the vacations, be used as schools for training our future country housekeepers. In cooperation with the Ministry of Public Instruction, we shall instal ourselves in University buildings and those used for the purposes of primary education; in this respect also the harmony between the two Ministries will bear fruit.

This appears to be the most economical solution of the problem of the training of girls in housekeeping and agriculture.

III. The Primary Agricultural Instruction of Boys and Girls.

CONTINUATION AGRICULTURAL INSTRUCTION.

It must not be forgotten that those who are not the favourites of fortune depend for their education upon the means of learning being brought, so to speak, to their doors, *i. e.* to their villages, since they have not the means of attending either the Agricultural Winter Schools, or the Technical Schools of

Agriculture. For these who represent the large mass of our peasant democracy, and who are most deserving and admirable from their love of work, their attachment to the soil, and their energy, we wish to establish with the cooperation of the Ministry of Public Instruction, a system of continuation Agricultural Instruction, the necessity of which measure is well recognized.

Experience has shown that the agricultural instruction given the children of from 9 to 12 years of age is not so satisfactory in its results as that imparted to young people who are over school age. Such instruction is more useful when given during the winter to boys between 13 and 18, who have finished their period of primary instruction, that is to say, at the moment when the youth who is already grappling with the practical difficulties of the subjects gladly welcomes and fully appreciates the assistance offered to him.

In order to carry agricultural instruction to the smallest village there is no need for the creation of new officers, which would require to be too numerous.

The instructor must of necessity be appealed to; the intimate collaboration of the Ministry of Agriculture and that of Public Instruction in the interests of our rural population is here again absolutely indispensable.

As M. Fernand-David, who has interested himself much in this subject, remarks, the teachers gain by this change, this extension of their social activities.

" They will be more in touch with the local necessities with which they will be in daily contact; they will better understand the wants of the peasants, whose life they will share; they will have clearer insight into the general mental life of the country, and their work of imparting knowledge will thereby be much facilitated ".

Agricultural instruction will not be exclusively professional. The teacher will not, of course, take it upon himself to teach his pupils the practical manual work entailed by cultural operations, which they will learn from their fathers. He will simply instil into their minds by means of object leasons the elements of physical and natural sciences as applied to agriculture. He will explain to them the " how " and " why " of all agricultural operations; tell them what fertilizers are, how they are bought and used, how to select good seed; the methods of feeding and improving cattle, " also, he will show them the benefits of cooperation, mutual assistance and foresight. The strictly practical side of his education will be learnt by the young countryman at his father's side during his daily work. There, he will have the opportunity of testing and applying the knowledge he has acquired during the master's theoretical instruction and it is in this manner that his education will be completed."

The instructors will not, as sometimes supposed, be professors of agriculture; for this their professional agricultural training would be insufficient. But there is no doubt that, prepared for their task in the manner presently to be described, and guided by professors of agriculture, they will be, from the agricultural point of view, of great service to the country by diffusing in all directions the first elements of this important science, and in certain cases, by acting as the mouth-pieces of our professors, they will increase a hundredfold the influence of the latter.

The agricultural instruction which we are divising for youths is to be offered also to girls in such a modified form as to enable them to become good farmers' wives and capable housekeepers.

Such continuation-school instruction as is here proposed, has existed for twelve years in Hungary, where it has been of great utility ; supplementary courses have also worked excellently in Germany and given satisfactory results. In Holland, for the last thirteen years instructors have been employed to give instruction to young men, and already 440 teachers have an agricultural diploma.

French agriculturists have been the first to demand housekeeping instruction. Our distinguished colleague, M. Fernand-David, brought forward on Dec. 5th 1910 the draught of a law on the subject of Popular Technical Agricultural Instruction, which sketches in broad lines the teaching of the future for which our scheme is, in due course, preparing the way.

M. Fernand-David's project provides for the instruction in agricultural matters of boys and girls from 13 to 18 years of age, on their leaving the primary school; but it entails the complete reform of primary education. He states, in fact, that the latter is at present too manifold, too encyclopaedic, and that certain subjects could well be deferred to the close of the primary course, when the intellectual horizon of the child has widened to that of the youth. Thus he would reduce the time devoted to primary instruction by ten hours (this would make the time given to children between 7 and 13 years of age 20 hours instead of 30) and add these ten hours on to the continuation instruction. This measure clearly implies the *obligatory* nature of continuation schools, for the curriculum of the primary schools cannot otherwise be shortened without fear of losing ground. Further, the scheme is only applicable if a parellel system of instruction is adopted in industrial and commercial industrial schools.

This comprehensive and excellent reform, which reminds one of a re-modelling of the work of Jules Ferry in adaptation to the new conditions of our social life, needs as a preliminary, a careful trial, a special and indispensable preparation such as is afforded by the draught of the law which we submit to you.

We shall not interfere with primary education; but shall merely place alongside of it continuation education. We shall thus avoid any compulsion, slight though this would be in any case, since the schools are only held in winter; but which would be a new thing to the farmers. Later on, when the rural population has had time to realize the benefits accruing from continuation agricultural schools, the obligation of attending them will be cheerfully accepted.

When the new teachers, better prepared at the Normal School, are more numerous, another law, that for example framed by our honourable colleague, could synthetize all the different efforts and apply them easily without fear of remaining a dead letter.

"A serious difficulty arises, when it is a question of organising continuation instruction, and this is the training of teachers". This difficulty has been studied and measures have been taken for what, we trust, will prove its satisfactory solution. An Interministerial Commission (Agriculture and Public Instruction) has examined the question of the agricultural preparation of the student-teachers at the normal school: these students, instead of receiving 40 lessons in agriculture in their 3rd year only, will in future receive from the lecturer of the departement assisted by an additional professor, 15 lessons the first year, 15 the second and 30 the third, *i. e.* 60 lessons in all.

The instruction in physical and natural science will be given distinctly from the agricultural stand-point and the lecturer of the département will question the candidates for the higher diploma on their application to that industry. Moreover, the remark attached on the third year to the certificate given at the end of the normal studies on the subject of agriculture will count very high in obtaining the *agricultural diploma* granted by the Ministry of Agriculture to those teachers who have had three years' experience in teaching and have successfully passed special examinations. Conferences and private lessons in the winter schools and in the professional agricultural schools will be given by the agricultural lecturers to teachers living in rural districts and preparing for this agricultural diploma.

From enquiries which have been made, it has been reckoned that there are about thirty instructors per départément, who have already of their own accord devoted themselves to agricultural instruction, and who could form the nucleus of the new teaching staff.

The collaboration of the Ministries of Agriculture and of Public Instruction required by M. Fernand-David, for the editing of the new programmes, for the inspection of the teaching and the training of the teachers has been brought about in the most harmonious manner, since due regard has been paid to the prerogatives of both.

Such is, in its entirety, the plan which we wish to carry out without delay for the reorganisation and development of our agricultural instruction. It is easy to see that it forms a complete whole, of which the parts are welded together. It is connected with the reforms of the professorial department, which are the subject of M. Viger's proposed law, and addresses itself without exception to all classes of the agricultural population. If it demands from the higher education, which prepares our professors, indispensable guarantees of the capabilities of our teachers, it allows of the ascent of the most gifted individuals from the lowest to the highest rung of the ladder, without any fear of intellects which reveal themselves successively being hindered by unfair restrictions and insuperable disqualifications.

Consequently if we cannot hope that this plan will be at once realized to its fullest extent, we do not for one moment doubt that the good-will of all and the approval of Parliament will shortly ensure the full application of this reform, which completes and synthetizes all the efforts of our predecessors.

DRAUGHT OF LAW.

THE PRESIDENT OF THE FRENCH REPUBLIC

decrees:

that the draught of the law, of which the content follows, shall be presented to the Chamber of Deputies by the Minister of Agriculture, the Minister of Public Instruction and of Fine Arts and by the Minister of Finance, who are charged with the duty of explaining its scope and of speaking in its favour.

A. THE INSTRUCTION OF YOUTHS.

Art. 1. — Technical agricultural instruction is imparted to youths:

1. *At the National Agricultural Institute*, founded in accordance with the law of Aug. 9th 1876, with modifications introduced by the present law.

2. *In the National Agricultural Colleges* (Grignon, Montpellier, Rennes), founded in accordance with the law of Oct. 3rd 1848, with modifications introduced by the present law.

3. *In the Technical Agricultural Schools* including:

a) the Practical Agricultural Schools founded in accordance with the law of July 30th 1875;

b) the Farm Schools founded in accordance with the decree of Oct. 3rd 1848;

c) the Technical Schools where the instruction deals with a special branch of agriculture (dairying, horticulture, vine-growing, drainage, irrigation, etc.), with modifications introduced by the present law.

4. *In the Winter Agricultural Schools.*

5. *In continuation courses of Agricultural Instruction.*

I. — *The National Agricultural Institute.*

II. — *National Agricultural Colleges.*

Art. 2. The National Agricultural Institute admits regular students and unattached persons.

The students have to pass a competitive examination.

A certain number of places, determined by law, are reserved for the certificated students of the National Agricultural Colleges and are distributed, after competitive examination, between the students of all three (Grignon, Rennes and Montpellier).

Art. 3. — On leaving the National Agricultural Institute, the students may complete their professional education and specialize in one of the following practical schools according to the decrees and resolutions regulating the admission of students to these establishments:

1. Schools of Water and Forests.
2. Horse-breeding School.
3. National Agricultural Colleges (*Higher Normal Section*, whose organization is regulated by decree).

Art. 4. — Candidates for the posts of special agricultural lecturer, lecturer in professional agricultural schools, assistant lecturer, demonstrator and heads of departments in the National Agricultural Institute and in the National Agricultural Colleges are chosen exclusively from the former certificated students of the National Agricultural Institute, who have specialized in the Higher Normal Section of the National Agricultural Colleges.

This does not however apply to candidates for the above-mentioned posts holding diplomas as " ingénieur agricole " or " ingénieur agronome " obtained prior to and for three years subsequent to the coming into operation of the said law.

Art. 5. — The instruction imparted in the National Agricultural Schools consists of two parts:

1. The practical instruction given to certificated students coming from the National Agricultural Institute, under the conditions set forth in article 3. (*Higher Normal Section*).

2. The instruction given to young men who intend to undertake the administration of country estates, or to enter the National Agricultural Institute (Agricultural Section, the organisation of which will be regulated by decree).

III. — *Technical Agricultural Schools.*

Art. 6. — Farm schools, practical schools and technical schools are classed under the generic name of " *Technical Agricultural Schools* ". Special technical schools are named according to their speciality.

Art. 7. — Technical agricultural schools can only be founded on estates placed at the disposal of the State for the period of eighteen years, at least, on an engagement entered into by the lawful owners with the Minister of Agriculture. These estates must include school and other buildings, which must be in perfect condition and comply with the requirements set forth by the Minister of Agriculture.

The State does not undertake to keep in repair or furnish the school buildings or other buildings, nor is it responsible for the dead and live stock, save in exceptional cases.

In spite of their title of technical schools, the farm and present practical schools belonging to private persons do not come under these regulations, nor do the special schools, which are prevented by the nature of their speciality itself from satisfying the requirements of §§ 1 and 2.

Art. 8. — The State is responsible for the salaries of all persons engaged in instruction or direction in the technical agricultural schools, and for all accessory educational expenses.

Art. 9. — The sum set apart for board and lodging of the students is fixed for each school by the Minister of Agriculture.

The State, the départements, and the communes can defray the total or partial expenses of the students of the professional schools of agriculture and give to certificated students exhibitions on leaving.

Art. 10. — The curriculum is fixed for each school by the Ministry of Agriculture, according to the agricultural speciality of the district, and according to the advice of a Superintendence and Improvement Committee, the composition and power of which are determined by ministerial decree.

There can be annexed to each technical agricultural school:

1. A winter agricultural school.
2. A school of agricultural housekeeping or a dairy school for girls during the long vacations, at the time when the men return to their homes.

Temporary courses can be arranged for adults in any technical agricultural school.

An advisory committee, comprising the whole teaching staff, is appointed in each school for the purpose of giving gratuitous information.

IV. — *Winter Agricultural Schools.*

Art. 11. — Winter agricultural schools are either stationary or travelling. Their aim is to give during the slack season technical agricultural instruction to the sons of farmers who are unable to spend two or three years at a technical agricultural school.

They are placed under the authority of the Minister of Agriculture.

Art. 12. — Winter agricultural schools can only be established in buildings which are placed at the disposal of the State and which contain the school furnishings considered necessary by the Minister of Agriculture.

1. They may be annexed to other establishments of agricultural instruction depending on the Ministry of Agriculture (technical agricultural schools, etc.).
2. They may also be established in buildings which are the property of " Lycées ", Colleges, Higher Primary Schools or any other educational establishment, provided the school furnishings

are placed at the disposal of the Minister of Agriculture, with the permission of Minister of Public Instruction, or the Minister under whose authority the educational establishment in question has been placed.

Art. 13. — The expenses of upkeep of the buildings and furnishings of the winter agricultural school placed at the disposal of the State by the Departments, Communes, Societies or Syndicates, devolve upon the said Departments, Communes, Societies or Syndicates.

Art. 14. — The directing and teaching Staff is nominated by the Minister of Agriculture.

In cases where the Winter Agricultural School is located on premises belonging to establishments depending on the Ministry of Public Instruction, or any other Ministry, the Director nominated by the Minister of Agriculture is only the *technical director* and has only to do with the instruction given at the winter agricultural school.

All the administrative work (boarding expenses, superintendence of the school, etc.), is placed:

1) under the direction of the headmaster, the principal of the college, the director of the higher primary school and, in general, of the chief of the establishment to which the premises belong;

2) under the control of the Ministry upon which is dependent the establishement in which the winter agricultural school is installed.

Art. 15. — The curriculum is fixed for each school by the Minister of Agriculture, according to the agricultural speciality of the district and according to the advice of a committee of superintendence and improvement, whose composition and powers are determined by a ministerial decree.

Art. 16. — Half of the sum necessary for the working of the school (salaries of the staff, expenses of teaching material, indemnities, etc.) and for paying the scholarships to students, is found by the State (Ministry of Agriculture) up to a certain amount fixed by law; the remainder devolves upon the département or commune which requested the founding of the winter agricultural school, except in special cases.

V. — *Continuation Agricultural Instruction.*

Art. 17. — Continuation agricultural instruction can be given in country public schools to young men who are unable to attend the agricultural schools.

The request for such instruction is made, either at a special sitting of the Municipal Council, or by the Commission of the département provided under Art. 20.

The General Council is requested to pass a vote at its next session; it will at the same time undertake to enter in the budget of the département a grant, which in no case shall be less than one quarter of the indemnity provided by Art. 19 below.

The Minister of Agriculture decides the matter.

Art. 18. — This instruction is to be imparted by the teachers to youths from the age of 13, for at least four years, during a minimum period of three months during the winter and for a minimum time of six hours per week.

Art. 19. — No person can act as instructor of continuation agricultural courses who is not provided with an agricultural diploma, granted by the Ministry of Agriculture under the conditions prescribed by a ministerial decree, on the recommendation of the Interministerial Commission mentioned in Art. 21.

Only those teachers are eligible who are provided with an elementary diploma and a certificate for aptitude in teaching, and who have had at least three years' experience in teaching.

All the teachers who possess an agricultural diploma, and who give the continuation agricultural instruction prescribed by the present law, will receve a special salary, not subject to any deductions, and will have a holiday fixed by law.

Art. 20. — In each département, a Commission is appointed entrusted with:

1) drawing up the plan of the courses of continuation agricultural instruction which seem to it desirable;

2) fixing the programme of the courses which are suitable for the district, with the approbation of the Ministers of Agriculture and Public Instruction.

This Commission of the département includes, under the presidency of the Prefect, a representative of the Ministry of Agriculture, a representative of the Ministry of Public Instruction and important agriculturists nominated by a ministerial decree.

Art. 21. — A permanent Interministerial Commission has been appointed, sitting at the Ministry of Agriculture, and made up of equal numbers of representatives of the Ministry of Agriculture and of the Ministry of Public Instruction.

This Commission is consulted with regard to regulations affecting continuation agricultural instruction, and upon the general organisation and the programmes of instruction most adapted to each district, as well as upon the agricultural teaching given in the primary normal school.

It also gives its opinion on all questions of continuation agricultural instruction which are submitted to it by the two interested Ministries, whether directly, or at the request of the commission of the départements.

Art. 22. — Continuation agricultural instruction is subject to the inspection of the representatives of the Ministry of Agriculture and to the inspection of the Ministry of Public Instruction. The note which will serve as a basis for the special salary mentioned in Art. 17 is drawn up conjointly by the officials of the twoMinistries charged with the inspection.

B. — THE INSTRUCTION OF GIRLS.

Art. 23. — Agricultural and housekeeping instruction is given to girls :

1. In the higher schools bearing the title of *Higher Schools of Agriculture and Housekeeping*. One of these schools contains a *Higher Normal Section* for the training of the professors and Directors of the schools of agriculture and house-keeping and is called *Higher Normal School of Instruction in Agriculture and Housekeeping.*

2. In *stationary schools of agriculture and housekeeping*, which bear the name of *Technical and Housekeeping Schools.*

3. In *temporary* schools of agriculture and housekeeping. These include :

a) *temporary stationary schools* (which are called Temporary Schools of Agriculture and Housekeeping) ;

b) *temporary travelling schools* (which are called Travelling Schools of Agriculture and Housekeeping) ;

4. In the *continuation courses of instruction in agriculture and housekeeping.*

All the schools of instruction in housekeeping and agriculture are placed under the authority of the Minister of Agriculture.

The teaching and directing staff of these schools is nominated by the Minister of Agriculture.

VI. — *Higher Schools of Instruction in Agriculture and Housekeeping.*

Art. 24. — The aim of the higher schools is to give to the daughters of proprietors and farmers a good education in matters pertaining to the agricultural profession, as well as higher agricultural and housekeeping instruction. They can only be founded on property belonging to the State, or placed at the disposal of the latter.

Art. 25. — The payment of the teaching and directing staff of the higher schools devolves, together with the accessory teaching expenses, upon the State.

Art. 26. — The sum allocated to the board and lodging expenses of the students is fixed for each school by the Minister of Agriculture.

The State, départements and communes can contribute whole or partial scholarships for the students of the higher schools.

Art. 27. — The programme of studies is fixed by the Minister for each higher school.

Art. 28. — There is an Improvement Council for each of the higher schools; its composition and powers are defined by Ministerial decree.

Art. 29. — The director and lecturers of the higher normal school of instruction in agriculture and kousekeeping are entrusted with the inspection of all the agricultural and housekeeping schools.

VII. — *Technical Schools of Agriculture and Housekeeping.*

Art. 30. — The technical schools of agriculture and housekeeping have for their object the instruction of farmers' daughters in agriculture and housekeeping, so that they may be able to collaborate intelligently in the proper management of a country estate. They correspond to the boys' technical agricultural schools.

Art. 7 (§§ 1, 2 and 3), Art. 8, Art. 9 and Art. 10 (§ 1) are applicable to technical schools of agriculture and housekeeping.

The three schools already existing at Coëtlogon, Kerliver and Monastier are exempt from the provisions of Art. 7.

A temporary agricultural and housekeeping school can be attached to each temporary technical school of agriculture and housekeeping.

A consulting committee comprising the teaching staff is appointed in each school to give information gratis to the farmers of the district.

VIII. — *Temporary Schools of Agriculture and Housekeeping.*

The object of the temporary schools of agriculture and housekeeping is to give instruction in agriculture and housekeeping to farmers' daughters who are unable to spend one or more years in one of the technical schools mentioned in Art. 23 of the present law. They correspond to the winter agricultural schools for boys.

Articles 12, 13, 14, 15 and 16 relating to winter agricultural schools are applicable to temporary schools of agriculture and housekeeping.

IX. — *Travelling Schools of Agriculture and Housekeeping.*

Art. 32. — The travelling schools of agriculture and housekeeping go from place to place, in a département or district, to give to farmers' daughters instruction in agriculture and housekeeping.

Each school is established by order of the prefect for a fixed time in a rural commune, where it is invited by the Municipality, or an Agricultural Association, with the guarantee that it will find the minimum number of pupils (of at least 15 years of age) determined by ministerial decree.

Art. 33. — The Commune or Agricultural Association which has invited the travelling school shall supply the building and school furnishings and pay the expenses of lighting and heating.

Art. 34. — The school curriculum is fixed for each session by the Minister of Agriculture, with the advice of a committee of superintendence and improvement, of which the composition depends upon ministerial decision.

Art. 35. — Half the sum necessary for the maintenance of the school (salaries of staff, cost of teaching material, indemnities, etc.) is paid by the State, up to a sum fixed by decree; the remainder, unless in exceptional cases, devolves upon the département.

X. — *Continuation Instruction in Agriculture and Housekeeping.*

Art. 36. — Continuation instruction in agriculture and housekeeping is given by the mistresses to girls in the country public schools. Articles 17 (§ 2) 18, 19, 20, 21, 22 are applicable to continuation courses in agriculture and housekeeping.

General Regulations.

Art. 37. — The contract of working for ten years in the service of public instruction, made by pupil-teachers of both sexes in the primary normal schools and higher normal schools can be fulfilled in the schools appointed by the present law.

Art. 38. — Regulations of public administration will determine the conditions of the application of the law, the provisions of which will be successively carried out, as far as the credit at the disposal of the budget each session permits.

All previous regulations not in accordance with this law are, and remain, abrogated.

1000 **A New Course of Agricultural Legislation, Administration and Co-operation in the Berlin Higher School of Agriculture.** (Unterricht in Rechts-, Verwaltungs- und Genossenschaftswesen an der K. Landw. Hochschule in Berlin). — *Nachrichten aus dem Klub der Landwirte zu Berlin.* Berlin, 27. April 1912.

Germany

In the second half-year of 1912, there was introduced into the instruction given in the Higher School of Agriculture in Berlin, a course, to cover two half-years, of agricultural legislation, administration and cooperation.

It is intended not only for those who propose to devote themselves subsequently to the management of Chambers of Agriculture and Agricultural Cooperative Societies, but likewise for future owners and managers of large farms, in the management of which, to-day more than ever, the necessity makes itself felt for a knowledge of agricultural legislation and administration, taking account likewise of the part which the owners and managers of farming estates are called upon to play in communal administrations, in which they are frequently required to act.

The instruction in question forms a higher supplementary course intended for the students who have already completed the obligatory studies for obtaining the agricultural diploma.

1001 BUSSE, W. **Agricultural Experimentation and Service in the German Colonies.** (Über das landwirtschaftliche Versuchswesen und den landwirtschaftlichen Dienst in den Deutschen Kolonien). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft,* Stück 20, pp. 288-291. Berlin, 18. Mai 1912.

German Colonies: East Africa

The following data and information on agricultural experimentation and the agricultural service in the German colonies represent the actual basis of these services which may and will be modified by the continuous agricultural progress of those colonies.

All matters regarding agriculture in the East African Colony are submitted to the " Referent " for agriculture. Agricultural experimentation is conducted at the following stations:

1. Biological Agricultural Institute at Amani which alone deals with research of a purely scientific character.
2. Kibongoto Agricultural Experiment Station, for agriculture and stock-breeding.
3. Mpanganya Cotton Experiment Station, originally a school for cotton growers.
4. Myombo Cotton Experiment Station.

The Government disposes of the services of a scientist exclusively for the study of cotton diseases and pests, and of an inspector for practical work in cattle breeding, while agricultural assistants who act also as travelling teachers among the natives are sent to those districts in which the output of produce for exportation is already important or is likely soon to become so.

Such "district agriculturists" are at present engaged in the districts of Bagamoyo, Kilwa, Lindi, Kissakki, Mrogoro, Muansa and Tabora. At Tabora another cotton experiment station is being erected.

Kamerun

In Kamerun also, at the seat of Government, a "Referent" for agriculture resides.

The centre of all agricultural experiment work is the Institute at Victoria.

At Buëa there are two stations, one for the breeding of pure Algau cattle, and of pigs, the other for the crossing of Algau with native cattle and for the cultivation of maize and potatoes.

At Dschang and at Djuttitsa there are also two stations for breeding the native hump-backed cattle and for crossing the same with Algau.

In order to meet the practical requirements of agriculture according to the special circumstances of the various districts, several of the administrative stations have agricultural employees attached to them for the management of the local experiment fields and gardens, as for instance at Duala, Edea, Bare, Yoko, Bamenda, and Garna. The chief aim of these stations is to promote the cultivation of produce for exportation.

At Bamum and Adamaua since 1911 technical agriculturists have been engaged on preliminary work for the introduction of cotton-growing and the institution of cotton experiment stations.

For 1912 a station for native cultivations, an inspectorship for oil palms, and one for cacao cultivation are planned.

South West Africa

The Government of South-West Africa at Windhuk disposes of four agricultural experts; one for stock breeding (excluding sheep) one for sheep, one for agriculture proper and one for fruit trees and vines.

The first agricultural stations that were founded are devoted chiefly to fruit and vegetables; they are situated at Windhuk, Grootfontein, Bethanien, Gobabis and Klein Windhuk. At Neudamm an agricultural station was founded for comparative experiments with cereals and forage crops and for dry-farming. At Okahandja a special tobacco experiment station is being installed.

For horse breeding there is a station at Nauchas, for Karakul sheep one at Fürstenwald near Windhuk, and for ostriches one at Otjitnezu.

Togo The Governor of Togo has an agricultural expert on his staff as adviser on matters connected with agriculture. There are besides three assistants occupied with experiments on cotton and with teaching the natives cotton-growing. The agricultural school at Nuatschä disposes of extensive installations for agricultural experimentation and has attached to it a cotton experiment station. Another such station exists at Kamaa and a third is in course of erection at Misahöhe.

New Guinea New Guinea does not yet possess a real experiment station. Only last autumn an agricultural expert was attached to the Government of that colony. At Rabaul there is an experiment garden for useful tropical plants.

Samoa The same may be said for Samoa, where only recently an agricultural expert has been sent out to assist the Governor.

1002 **Agricultural Experiment Station in Peru.** — *Peru To-Day*, Vol. III, No. 12, p. 33. Lima, March 1912.

Perù The Government has established the " Estación General Agronómica del Perù " as a central control of theoretical and experimental agriculture at Santa Beatriz, combining existing services and creating new ones in harmony with them. There will be a section of general agriculture devoted to study and experimentation concerning acclimatization, manuring and cultivation of plants. A section of applied botany and vegetable physiology, devoted to the study of the flowers and plants indigenous to the country, their diseases and propagation. A section of microbiology, serums and vaccine. One of physics and agricultural chemistry for analysis of products. A zoological section, to study the races of animals desirable to be introduced and the improvement of those now present. One of applied technology to study the use and manufacture of agricultural products. A section of viticulture and wine making. A section to entomology, dealing with harmful insects, silk culture, bee-keeping, he propagfation of fish, etc. A forestry section, including fruit and ornamental trees. One of rural engineering, to develop types of construction suited to the different climates and conditions of the Republic, agricultural machinery, etc. A propaganda section, to collate and publish the results of the work in the separate stations and spread the information among the farmers.

The Central Station will be under the immediate direction of the Director of the National Agricultural and Veterinary School at Santa Beatriz. The experimental stations at Ica, Moquegua, Lambayeque and Iquitos, are placed under the control of the Central director.

This is in line with the Government's serious work in irrigation of the coast lands and the support of every measure that tends to develop the agricultural wealth of the Nation.

AGRICULTURAL INSTITUTIONS.

Illustration Farm and Neighbourhood Improvement Associations. — *Dominion of Canada, Commission of Conservation.* (Communicated to the Institute). 2008

For the past two years (1910 and 1911) the Committee on Land of the Dominion Commission of Conservation has conducted a survey of about 100 farms in each of the Provinces of Canada, in order to obtain information regarding the areas in various farm crops, the management of each farm in respect to crop rotation, seed selection, care, uses and production of manure, the keeping down of weeds, and the fuel, power and water supply. The information thus obtained is considered to be fairly representative of the agricultural conditions of the country. It is now proposed to join the farmers in conducting an improvement association and illustration farm in each locality where the investigation is to be continued; the illustration farm to be owned and managed by an individual farmer in the locality. **Canada**

As a consequence of these surveys, the Commission has this year determined to establish illustration farms in each of the provinces. The plan is to select a farm in a certain locality whose owner agrees to be guided by the advice of the agricultural experts provided by the Commission. This farm will become an illustration centre for the purpose of demonstration, and instruction will be held on it from time to time. In this way it is hoped that the farmers will be led to see that they can produce much more profitable crops with the means actually at their hand.

The farmers who are learning are learning much from their successful neighbours. If such contacts could be brought about that more of them will learn, and all of them will learn more, a fine advance will be made towards the solution of many of their difficulties. The farmers will be invited to meet together for the purpose of getting useful information from each other and from the Experts of the Commission for the improvement of their farm management and practice. There has been among farmers too much separateness, and want of cordial co-operation. These cannot be corrected by bulletins or by speeches. The way is to get the farmers to come together and do something for themselves and others something definite, something they can see and understand, something that they can use for their own benefit. When each becomes a co-operating partner in the local improvement association for the good of the locality, all will grow strong in association effort.

A Constitution has been drawn up for the purpose of organizing these Farmers' Associations. The aims and objects of the Association are stated as follows:

Section I. — To co-operate with the Committee on Lands and the Experts of the Commission of Conservation in the investigation of various rural problems; to promote the general advancement of rural industries in the neighbourhood; and to encourage the use of such means and methods as will improve the quality and quantity of the products of the farm while maintaining or increasing the fertility of the soil, more particularly through the use of an Illustration Farm in the neighbourhood.

Section II. -- To discuss ways and means whereby farming may be made more satisfactory by improving the surroundings and conveniences of the dwellings; by stimulating interest in the performance of farm operations in the most workmanlike and enjoyable way and by fostering a love for the study of nature.

Section III. — To consider and adopt means for the improvement of the social life of the community by having the people meet frequently to discuss questions that concern the whole community, and by encouraging co-operation and united action in directing and utilizing the local forces and agencies for these purposes.

There is the usual provision for the election of officers and their duties.

Any farmer or other citizen residing in the vicinity of the illustration farm or where the meetings shall be held may become a member of this Association if he is interested in better farming and pays a membership fee of 25 cents annually.

Meetings shall be held from time to time on the illustration farm or elsewhere at the discretion of the officers of the Association and upon the request of the Field Expert of the Commission of Conservation.

AGRICULTURAL SHOWS AND CONGRESSES.

International Exhibition of Rice Growing and of Irrigation, at Vercelli, in October-November 1912 (1). (Esposizione Internazionale di Risicoltura e di Irrigazione a Vercelli nell'Ottobre-Novembre 1912). **1004**

In October and November 1912, there will be held, at Vercelli in Piedmont, an International Exhibition of Rice Growing and of Irrigation. The programme is as follows: **Italy:**

A. — RICE GROWING.

I Division. — Retrospective exhibition of rice growing.

II Division. — Meteorology, hydrography, geology in relation to rice growing.

III Division. — Fish and fish culture in rice fields.

IV Division. — Establishments, machines, and materials, for cleaning, hulling and refining rice.

V Division. — Rice industry.

VI Division. — Hygiene in the rice-field.

VII Division. — Instruction in agricultural technique, agricultural associations in the rice-field districts, unions of rice-field workers, bureaus and offices for work and organisation.

B. — IRRIGATION.

I Division. — Sources of water.
II » — Damming the water.
III » — Artesian wells.
IV » — Elevators.
V » — Reservoirs.
VI » — Maintenance of levels.
VII » — Mechanics applied to irrigation.
VIII » — Monographs on irrigation.
IX » — Syndicates for irrigation.

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(1) See *B.* March 1912, No. 471; April 1912, No. 617. (*Ed.*).

1005

Horticultural Competitions, Shows and Meetings in France in 1912

(Dates des Expositions, Concours et Assemblées Générales en 1912). — *Journal de la Société Nationale d'Horticulture de France*, Tome XIII, p. 43. Paris, avril 1912.

France

The *Société Nationale d'Horticulture de France* communicates the following dates of French Exhibitions and Competitions to be held in Paris:

July 11 - Rose and Vegetables Show.
August 8 - Gladiolus Show (plants in flower).
Sept. 12 - Dahlia, Aster, and Fruit Show.
Oct. 10 - Early Chrysanthemum, Orchid and Fruit Show.
Nov. 8-17 - General Autumn Show.

Besides plants, flowers, fruit, and vegetables, any novelty connected with horticulture will be admitted.

The Spring and Autumn Shows are held at Cours la Reine, the others in the Horticultural Society's building.

1006

Royal Dublin Society's Sheep Show, 1912.

United Kingdom: Ireland

The Royal Dublin Society will hold a Sheep Show on the Society's premises on August 28 and two following days, open to competitors from all parts of the United Kingdom.

The competition will include long-woolled and short-woolled sheep.

There are many prizes, chief of which are the perpetual challenge cups, one of which is offered alternately for competition in the long-woolled Border Leicester, Roscommon, Lincoln and Black-faced Mountain sheep classes, the other alternately in the short-woolled classes: Shropshire, Oxford Down, Cheviot and Suffolk. There are besides other challenge cups and minor prizes of various degrees for both divisions.

1007

Canadian Exhibitions and Fairs in 1912.

Canada

In 1912 the following agricultural exhibitions and fairs will be held:

July 8-10 Western Canada Racing Circuit at Moose Jaw:
» 20-26 » » » » at Brandon.
» 23-26 Interprovincial Fair, Brandon.
» 29-August 3. Provincial Exhibition at Regina.
August 6-9. Agricultural and Industrial Exhibition, Saskatoon.
» 10-17. Vancouver Fall Fair, Vancouver.

August 12-17. Canada's Great Western Fair, Inter-Provincial Stock Show and Race Meet, Edmonton.

August 19-24. Lethbridge Agricultural and Industrial Exhibition, Lethbridge.

Aug. 24-Sept. 9. Canadian National Exibition, Toronto.

This Exibition will have special buildings for horticulture, agriculture, farm machinery and implements, dairying, and poultry keeping.

The live stock show will include horses of all classes, cattle, especially shorthorns, sheep and pigs.

Aug. 31-Sept. 7. St. John N. B. Exhibition, St. John.
Sept. 5-16. Central Canada Exhibition, Ottawa.
» 6-14. Western Fair, London.
» 11-19. Nova Scotia Provincial Exhibition, Halifax.
» 16-23. Fredericton Exhibition Biennial Fair, Fredericton.
Oct. 1-5. Provincial Exhibition, New Westminster.
Prince Edward Provincial Exhibition, Charlottetown.
Oct. 21-26. International Dry Farming Congress, Lethbridge.
Nov. 14-18. Ontario Horticultural Exhibition, Toronto.
Ontario Cattle Breeders' Association, Toronto.
Ontario Swine Breeders' Association, Toronto.
Ontario Sheep Breeders' Association, Toronto.
Nova Scotia Fruit Growers' Association, Port Williams.
British Columbia Fruit Growers' Association, Victoria.
December. Toronto Fat Stock Show, Toronto.

Among the above Exhibitions and fairs the Vancouver Fall Fair presents especial interest. It offers prizes for horses of all classes such as Clydesdales, Shires, Percherons, Belgians, Suffolk Punches, Coach-horses, Ponies. Among cattle, prizes are offered for Shorthorns, Herefords, Red Polled, Aberdeen Angus, Galloways, Ayrshires, Holsteins, Jerseys and Guerneseys. The sheep classes include Cotswolds, Leicesters, Shropshires, Oxford Downs, Southdowns, Dorset Horns, Lincolns, Hampshires, Suffolk Downs, Rambouillets and Merinos, besides Angora and milch-goats. Pigs comprise Yorkshires, Chester Whites, Berkshires, Poland Chinas, Tamworths, Duroc Jerseys and Essex. At the fair, besides pigeons, rabbits and guinea pigs, poultry of American, Asiatic, Mediterranean, Polish, Hamburg, French and English breeds will be represented. The agricultural show will include cereals, grasses, pulse, roots, flowers and fruit, for all of which prizes are offered. Nor will bee-keeping be forgotten. Dairy produce will have a a large number of classes, nineteen, with prizes and certificates. A special class with prizes will be open to the produce of Indian agriculturists, namely wheat, oats, potatoes, apples, pears, etc.

1008 International Dry Farming Congress and International Congress of Farm Women: Seventh Annnal Session, Lethbridge, Alberta, Canada, October 21-26, 1912 (1).

Between the 21st and 26th of October 1912 the Seventh Annual Session of the International Dry Farming Congress with its auxiliary, the International Congress of Farm Women, will be held at Lethbridge, Alberta, Canada.

Canada

The Congress is a popular scientific society; its nine sections are:

Soil, Tillage and Machinery.
Crops and Breeding.
Agricultural Forestry.
Live-stock and Forage.
Agricultural Education.
Farm Management.
Scientific Research.
Conference of Agricultural Colleges and Experiment Stations.
Rural Homes.

Mr John T. Burns is the Executive Secretary-Treasurer of the International Dry-Farming Congress, Lethbridge, Alberta.

Women of the farm desiring to cooperate with the International Congress of Farm Women should register in the section of Rural Homes. Address: Mrs G. L. Burns, Secretary of the International Congress of Farm Women, Lethbridge, Alberta, Canada.

The official magazine of the Congress is "Dry Farming".

An agricultural show will be held in connexion with the Congress. Exhibits must have been grown without irrigation (under a precipitation of not more than 20 inches). They will consist of:

1. Sheaf Exhibits of Grain.
2. Sheaf Exhibits of Forage.
3. Threshed Grain Samples.
4. Samples of Ear Corn.
5. Vegetables and Roots.

For information concerning the Exhibition, letters are to be addressed to: J. W. Mc Nicol, Chairman, Dry Farming Exposition Committee, Lethbridge, Alberta, Canada.

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(1) Cf. *B.* May 1912, No. 773. (*Ed*).

Agricultural Show Dates in Natal, 1912. 1009

Besides several agricultural and live stock-shows which have already been held in the Natal, Orange Free State, and Cape Provinces, the following will be held in Natal in the course of the present year:

Natal

Durban	July 3, 4, and 5.
Lower Umzimkulu (Port Shepstone)	» 9
Camperdown	» 11
New Hanover	» 24
Richmond	Dates not fixed.
Alexander County	
Ixopo	
Noodsberg Road	

Batavia International Rubber Congress and Exhibition in April 1914. 1010

(Congrès International pour le Caoutchouc et Exposition qui auront lieu à Batavia en avril 1914).

Dutch East Indies

In April 1914 there will be held at Batavia an International Congress and Exhibition of Rubber. They will be organised by the Dutch-East-Indian Agricultural Syndicate (" Nederlandsch-Indisch Landbouw-Syndicat "), the same institution which in 1911 took the initiative in regard to the congress and exhibition of textile plants at Soerabaya.

The Congress and Exhibition will comprise everything relating to the production and preparation of rubber, plantation and wild, the cultivation and industry of balata, jelutang and guttapercha.

The Exhibition will be the first held in a rubber-producing country.

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

1011 VIDAL, E. **The Discharge of Rockets to keep off Hail.** (Les tirs de fusées contre la grêle). — *Le Progrès Agricole et Viticole,* 29e Année, No. 18, pp. 556-570. Montpellier, 5 mai 1912.

France

The enthusiasm with which hail guns were first greeted has given place to a certain scepticism, which is invading both the practical and scientific worlds, in consequence of the negative results obtained in Italy and France by experiments conducted on a large scale. But the principle of the researches, which consists in disturbing the motionless stratum of the atmosphere where the hail is formed by a storm of sound waves, remains untouched; only the means employed appear to be insufficient for the purpose. The gaseous missile rises with difficulty in a denser medium. The wind carries away the resulting great air-waves more or less horizontally, according to its strength, as occurs in the case of those caused by bell-ringing.

As regards other means which could be adopted as an efficacious remedy for hail, the writer suggests replacing the harmless charge of detonators in the form of guns, by a discharge of rockets capable of rising to a height of some hundreds of metres into the air. The fuse is regulated so that the rocket explodes among the clouds.

In support of the efficacy of this scheme, the writer cites two very instructive cases of storms when the hail destroyed whole districts, sparing, however, places where rockets had been let off. On August 1st, 1904, a severe storm descending from the summit of the Grand Muveran, in the Upper Rhone Valley, passed along the upper portion of the Lake of Geneva following the right shore, without being able to leave it, as far as Lausanne. It then passed through the Morges depression, in Canton Vaud, devastated the wide plain watered by the Venage, hurled itself against the Dent de Vaulion, rebounded from these steep slopes, entered the basin of the Thièle, and finally lost itself in the lake of Neuchâtel. Within the devastated zone, two small communes only, like two islands, escaped damage: the communes of Echichens and Lonay, where alone rockets were used.

For the same reason, during the storm of June 10th, 1910, the four communes of Esparron, Pontevès, Roquettes and Roquebrune (France) were spared by the hail.

The writer gives interesting details concerning the manufacture and use of the rockets. The following are some of his most important conclusions:

Hail-prevention rockets must, in the first place, be capable of exposure for a certain time to rain with impunity; it is therefore necessary to provide them with a water-proof covering and also to protect their fuse. They should be able to rise high enough to explode just under the storm clouds, *i. e.* at an altitude of 450 to 500 m. (1475 to 1650 ft.).

The firing may be done by individuals, or collectively. In the first case, a man with a stick provided with two rings of flattened iron wire, which serve to support the projectile at the moment of setting fire to it, could protect 40 acres by letting off in the middle of his property at least four rockets reaching an average height of 1650 ft. The cost would only be from 9 to 12 fr. (7*s* to 9*s* 6*d*).

In the second case, the advantages are even more evident and greater. The places for the operation must be carefully chosen, and strategic positions selected by reference to the map and the ground; they should be placed at intervals following the habitual course of the storms.

If in the great experiments carried out at Castelfranco, the guns for averting hail, instead of being scattered about at random over this vast area, had been placed along the course of the storms, that is to say along the deep valleys which descend into the Venetian plains from the Carnic Alps, the results would probably have been very different.

The writer followed these principles in the choice of suitable places for letting off the rockets, in order to protect the basin of Gannat. Each firing post protected an average area of 620 acres, *i. e.* ten times as much as if it were isolated. The total cost of the guns and of the explosives for three consecutive years, for eighty firing posts, did not exceed 16 000 fr. (£640), *i. e.* an average of 200 fr. (£8) per post. Calculating that 12 projectiles are let off

AGRICULTURAL GEOLOGY.

Agricultural Geology in Siberia.

1018

1*. Lebeder, I. K. Voprosu o potchvenn-selskokhosiaistvennekh Uslowakh Akmolinskoi Oblasti. (On the Agrogeological Conditions of the Province of Akmolinsk, Siberia). — *Xurnal Opetnoi Agronomii* (Review of Experimental Agriculture) G. XIII, Kniga 2, pp. 240-241. S. Peterburg, 1912.

2*. Novikov, A. Primorskaia Oblast-Gheologicheskoie Stroienie i Potchvi. (On the Agrogeological Conditions of the Province of Primorskaya, Siberia). — *Isviestiia Juxno-Russkoi Oblastnoi Semskoi Pereselchincheskoi Organisazii.* (Transactions of the South Russian Society for Agricultural Emigration), G. Isdaniia Piati, No. 53, pp. 47-48. Poltava, Fevral-Mart 1912.

Siberia

Province of Akmolinsk. — The Author visited the districts of Omsk, Akmolinsk and Atbasark, studying especially their agrogeological conditions in connection with the great problem of emigration. Many data are given on the morphology of the soils compared with the flora, topography and lithology of the various localities and a practical and complete survey of the agricultural possibilities in view of the near colonisation of the region.

The district of Omsk can be divided for this purpose into two distinct parts. In the north the woody steppe predominates and the following soils are met with: black soils, " chernozem ", mixed black soils, saline soils of columnar structure and " podsol ". With the exception of the saline soils and podsol, which are not very extensive, all the rest of the territory is rich and fertile and adapted to the most varied crops of the cold temperate zone.

From a topographical point of view the best soils are those on the plateaux forming watersheds; medium soils cover the slopes, while the worst are found in the depressions and low-lying plains. Though they are soils easily exhausted, yet in practice farms based on the practice of fallows are very possible.

In the southern part of the district of Omsk, agrogeological conditions are much more varied and complex: light coloured, chocolate coloured soils, moist saline soils with columnar structure, loams, are variously combined and contribute to produce within a short distance from each other the most varied agricultural conditions.

The topographical factor has here a completely different signification from what it has in the northern belt, where the best soils are found in the plains and in the bottoms of valleys (dark chocolate coloured); the medium soils occupy the slopes and the worst are situated on the plateaux. On the whole the agricultural possibilities are not great, as for the major part the soil is not very fertile and is difficult to till, though here and there, like oases, there are some fertile patches. Colonisation on a large scale is not advisable, nevertheless the system of small holdings might develop satisfactorily.

In the district of Akmolinsk and Atbarsk the following types of soil exist:

1) saline soils: *a*) moist, *b*) with columnar structure, *c*) intermediate.

2) Stony soils (stones with some mould).

3) Chocolate coloured soils varying in aspect and mechanical properties, according to the locality.

4) Calcareous soils with varying degree of moisture.

Only these two last types are utilisable. Their great tenacity renders them difficult to work, at least eight oxen being required to plough to a depth of 4 inches.

Province of Primorskaya. — The present relief of the region and the nature of its soils are due in the first place to its geotectonic structure, and then to volcanic activity and to erosion.

On the one hand there are the uniform, compact crystalline plutonic rocks, on the other the varied and complex alluvial deposits.

The granite mass, to a great extent covered by tufa, basalts and trachytes, and alternating with gneiss and quartzite, crops out extensively on the eastern slopes. The weathered volcanic rocks form the marl clay subsoil, but slighlty permeable and not favourable to agriculture and liable to form swamps.

The soil of the valleys and of the low-lying plains is constituted by black earth, " chernozem ", which in some places is 8 inches deep.

Elsewhere the soil is loamy and covered by a shallow layer of humus.

Both on the high lands and on the slopes, clay soils bearing a deep covering of humus are also met with. They are very rich in moisture owing to the impermeability of the subsoil. Sometimes they are so mingled with stony detritus as to be useless, even for pastures.

In the upper part of the Ussuri basin there are terraces of rich fertile soil separated from each other by extensive grass lands and woods. The bottom of the valley is unfit for agriculture, being moist steppe with large areas of swamps.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

1014 VOGEL VON FALCKENSTEIN, K. **Dunes and Afforestation.** (Untersuchung von märkischen Dünensandboden mit Kiefernbestand. Aus dem Mineralogischen Institut der Universität Berlin.). — *Internationale Mitteilungen für Bodenkunde,* Bd. I, H. 1, pp. 495-517. Berlin, 1912.

The Author has investigated a dune belt of sandy alluvial formation covered with regular stands of Scotch pine with beech underwood, presenting in some recently cleared parts great difficulty of regeneration.

Germany The physical and chemico-mineralogical analyses of the soils lead to the noteworthy conclusion that while from this point of view the soils do not present observable differences, the pine stands present great diversity, ranging from classes I to IV of productiveness.

From this and other facts observed, for instance on the heaths of Lüneburg, it would appear that in order to obtain good crops of Scotch pine it is sufficient to have minimum quantities of certain nutritive mineral substances, the abundance of which in a soil, though constituting an advantage, would nevertheless not be a condition of fertility for Scotch pine. This would form an exception to Schülze's rule, according to which the fertility of a sandy soil is determined mainly by the percentage of nutritive mineral substances. On the contrary, according to the investigations above referred to, the range of productiveness of soils would be directly proportional to the percentage of nitrogen and humus, that is to say that in the case under review the determining factor of fertility is formed by the quantity of nitrogen and humus present in the soil.

Hence the conclusion of great practical interest, that the quantity of nitrogen accumulated in a forest soil far exceeds the selling value of the same, but it is so far from stable that it is very rapidly dispersed in consequence of improper treatment.

A second and even more important conclusion would be the prospect of being able to re-afforest poor (sandy) soil without min eral manuring when, by suitable care of the land, the accumulation of humic and nitrogenous substances, representing a gratuitous by-product of a normal forest property, is promoted. This seems to be confirmed by the experiments carried out for years past over extensive areas by the forest inspector Wiebecke.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

1015

Irrigated Farms and Lands in California. — *Report of the California State Board of Agriculture for the Year 1911.* 1 Vol., pp. 408. Sacramento, 1912.

United States: California

Some figures, taken from the Report of the California State Board of Agriculture for the year 1911 on irrigated farms and lands, are given here in tabular form, so as to give a general view of the acreage under irrigation and of the annual cost of operation and maintenance.

Irrigated Farms and Lands in California in 1910.

Number of Farms in the State	88 197
Approximate land area (acres)	99 617 280
Improved land in farms (acres)	11 389 894
Total value of farm land	$ 1 317 195 448
Average value per acre of farm land	$ 47.16
Number of farms irrigated	39 352
Acreage irrigated	2 664 104
Area enterprises were capable of supplying in 1910	3 619 378
Area included in projects	5 490 360
Per cent of number of farms irrigated	44.6
Per cent of total land area irrigated	2.7
Per cent of improved land in farms irrigated	23.4
Number of independent enterprises	13 970
Total length of ditches (miles)	21 129
Length of main ditches (miles)	12 599
Length of lateral ditches (miles)	8 530
Number of reservoirs	1 604
Capacity of reservoirs (acre-feet)	743 269
Number of flowing wells	2 361
Number of pumped wells	10 710
Number of pumping plants	9 267

Engine capacity of pumping plants (HP) . .	123 590
Acreage irrigated with pumped water . . .	309 134
Acreage irrigated with flowing wells	55 818
Total cost of irrigation systems	$ 72 445 669
Average cost per acre	$ 20.02
Average annual cost of operation and maintenance	$ 1.54

1016 FORTIER, SAMUEL and BECKETT, S. H. **Evaporation from Irrigated Soils.** — *U. S. Department of Agriculture. Office of Experiment Stations, Bulletin* 248, pp. 1-77 Washington, 1912.

United States

Experiments have been carried on for some years in the United States for the purpose of ascertaining the amount of water lost by evaporation from irrigated soils treated in different ways.

The experiments were directed to the three principal points, which are as follows:

1. The influence upon evaporation of soil mulches.
2. Evaporation on cultivated and uncultivated soil.
3. The influence of a more or less deep irrigation on evaporation.

The experiments were made, under varying conditions, by the Experiment Stations of California, North Dakota, Idaho, New Mexico, Nevada and Washington.

I. *The influence upon evaporation of more or less deep soil mulches.* — The following are the united conclusions of the five Experiment Stations.

Speaking generally, when western soil containing sufficient moisture to germinate seed and maintain plant growth is irrigated to a depth of 6 inches over the surface and not cultivated after, it is safe to assume that 1 ½ to 2 inches of the 6 inches applied will be lost by evaporation in a period of 30 days.

The quantity lost by evaporation will increase with the percentage of moisture in the soil. In extreme cases of heavy moisture content and high temperatures, 3 to 4 inches may be lost in 30 days. Soil mulches lessen evaporation. A dry granular soil mulch 3 in. deep will save one half of the loss by evaporation. A like mulch 6 inches deep will save $^3/_4$ of the evaporation; a 9-inch. mulch gives a further saving, but the cost of cultivation and other practical considerations would seem to limit the depth to 6 inches or less.

Figure No. 1 represents the average evaporation losses at five stations from tanks of soil protected with mulches of different depths during the first 21 days after irrigation.

II. *Evaporation losses from cultivated and uncultivated soils.* — The average total losses during the 28 days following irrigation were 2.13 inches from the uncultivated, and 1.58 inches from the cultivated soils, being 35.5 % and 26.3 % respectively of the total 6 inches used in irrigation.

Thus it is seen that cultivation reduced the loss more than 25.8 %.

Fifty-one per cent of the loss from the cultivated surface occurred in the first three days, that is, during the average period between irrigation and cultivation, while during the same period the uncultivated tanks lost 38.5 % of the total.

If only the losses after the first cultivation are considered, the saving due to cultivation averages 40 % of the loss from the uncultivated soil.

The uniformly heavy losses immediately after irrigation emphasize the necessity of early cultivation, especially in the heavier soils, where the percolation of moisture though the soil is slow, and the moisture content of the surface soil is high.

Fig. 2 represents graphically the average evaporation losses from cultivated and uncultivated soils during the first 28 days after irrigation (average of losses at six Stations).

III. *The effect upon evaporation of shallow irrigation and deep irrigation.* — As shown by the following figures, which were communicated by the Stations of Nevada and California, the saving in deep furrow irrigation in a 28-day period was considerable.

Depth of irrigation	Total losses	Amount saved over superficial irrigation
Superficial irrigation	0.58 in.	—
3 in. furrows	0.38 »	0.20 in.
6 in. »	0.25 »	0.33 »
9 in. »	0.18 »	0.40 »

The figure (3) refers to the same Stations and shows the evaporation during the 28 days which follow irrigation.

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9 in. »	0.18 »	0.40 »

The figure (3) refers to the same Stations and shows the evaporation during the 28 days which follow irrigation.

General practical conclusions.

In the case of a very limited supply of water, fewer and deeper furrows are of the greatest benefit. The water is placed well into the soil and only a small percentage of the surface soil is wet, thus lessening the evaporation.

Deep furrow irrigation is also to be recommended in heavy clay soils, which, owing to their imperviousness, tend to hold the moisture near the surface. This type of soil favours capillary movement and heavy evaporation losses are the result.

If the plants are shallow-rooted, deep irrigation is to be avoided, but on the other hand in the case of deep-rooted crops shallow irrigation would attract the fibrous rootlets to the surface of the soil, where they would be destroyed by cultivation or drought.

Cultivation should be practised as early as possible after irrigation to prevent evaporation and aerate the soil. In cases of heavy evaporation losses, the capillary rise of water carries the salts (nitrates, sulphates and phosphates) to the surface of the soil, and when the water evaporates, the salts are left above the feeding zone of the plant roots.

Analyses of the first inch of mulched and non-mulched soils made by Prof. F. H. King, show that the mulched surfaces contain a much smaller percentage of nitrates, sulphates and phosphates, than do unmulched. Again, if the surface soil is well mulched, the storage and penetration of the water is promoted, which carries back to the roots the salts that have been deposited at the surface; in the case of unmulched soil, the salts are carried away by surface drainage.

The orange is said to be a shallow-rooted tree in its natural state, and the tendency of the roots is to spread out near the surface, especially in the rainy season in California. It is, however, doubtful if the roots found in the upper 6 inches of soil are of any benefit to the tree, for while they may collect both food and moisture during the rainy season, they are destroyed by the excessive evaporation between irrigations in summer.

It is thought better, therefore, to prevent the extension of the roots through the top layer of soil by frequent deep cultivations. Some orchards have been destroyed by long-continued shallow cultivation having created a compact layer of soil, often several inches in depth.

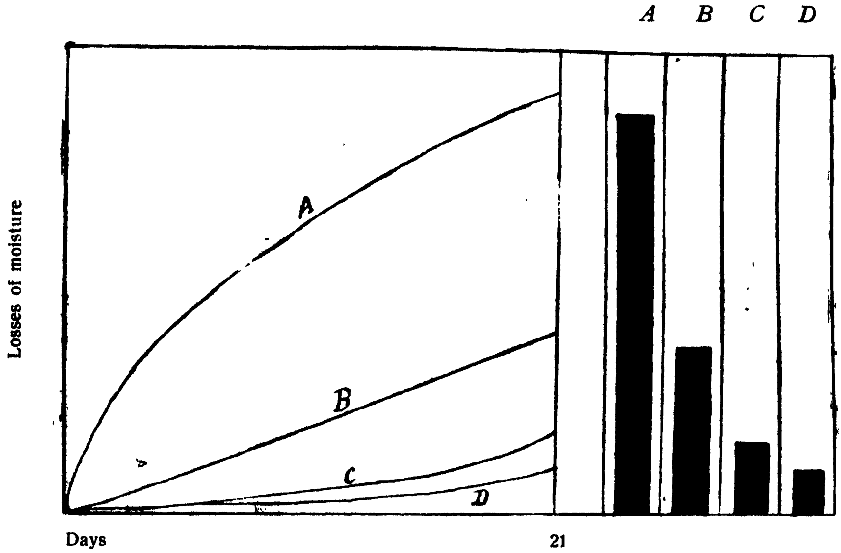

Fig. 1. — Influence of surface mulch on evaporation (average of 5 stations). *A*, without mulch; *B*, 3 in. mulch; *C*, 6 in. mulch; *D*, 9 in. mulch.

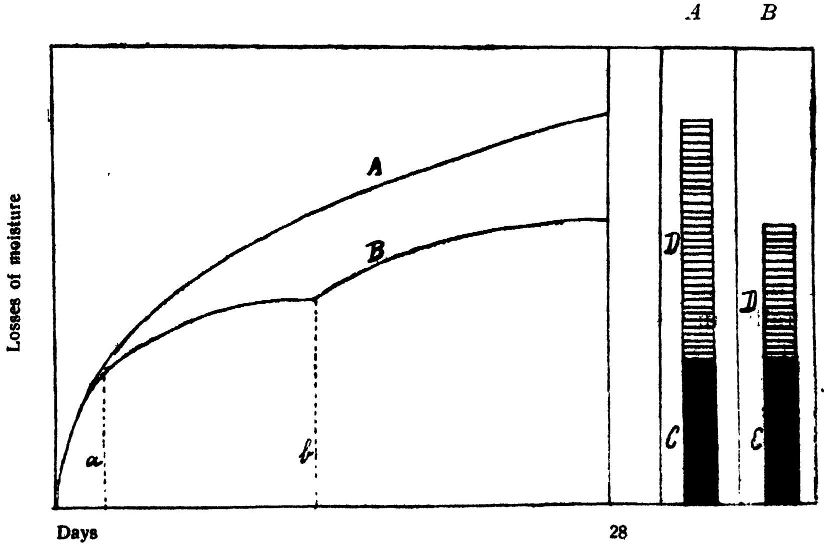

Fig. 2. — Evaporation from cultivated and uncultivated land (average of 6 stations). *A*, uncultivated; *B*, coltivated; *a*, first coltivation; *b*, second. *C*, first three days; *D* remaining 25 days.

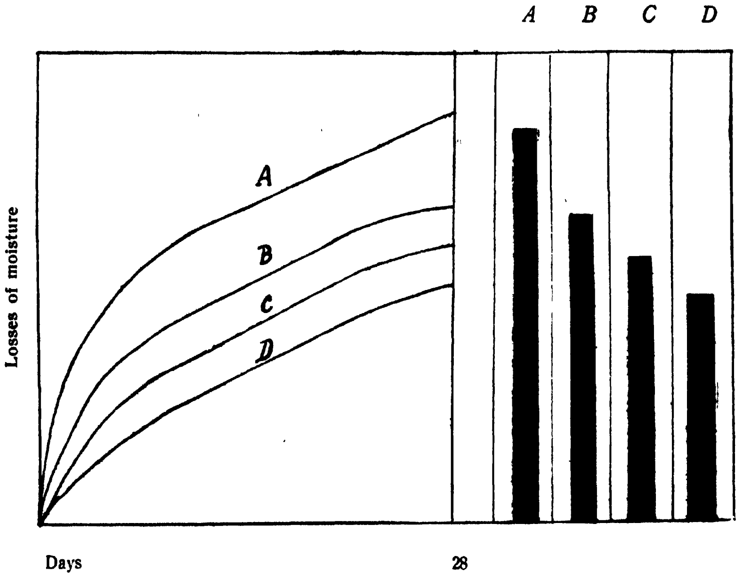

Fig. 3. — Influence of depth of irrigation-furrows on evaporation (average of two stations). *A*, surface irrigation; *B*, 3 in. furrows; *C*, 6 in. furrows; *D*, 9 in furrows.

1017 **Combined Irrigation and Drainage in Egypt.** (L'irrigation et le drainage combinés en Egypte). — *Revue Scientifique*, 49e Année, pp. 693-694. Paris, 1er juin 1912.

Egypt

Irrigation combined with drainage is used in the Egyptian rice-fields over considerable areas. On low-lying ground where the water-table is only a few decimetres below the surface, in order to avoid pumping all the water out, it is removed, as far as possible, by means of superficial trenches. These are at right angles to a principal collector which they cross by means of channels or pipes. Thus only the water percolating into the collecting trench, which is 4 to 5 ft. deep, requires pumping out. The pumps used have generally an aspirator pipe 8 in. in diameter.

This system removes the salt from the soil more completely, while at the same time it facilitates the aeration of the soil and the crop. About 4 inches of water are kept on the fields.

The drainage commences on May 15th and finishes on Nov. 1st, *i. e.* it lasts for three and a half months during the sinking and two months during the rising of the Nile.

The results of pumping show that the amount of percolated water is about 260 cub. ft. per acre per 24 hours during low water; in flood time this rises to 400 cub. ft. When the removal of salt is the chief object, the stratum of water should be deeper and the trenches deeper and also open to the air; made thus, they draw off the salt better than tiles.

In the Manchiet Kafr-Garaida experiments, the sodium chloride content was from 0.5 to 3 % in percolated water, and from 0.03 to 0.39 % in surface water. There is also a larger proportion of sulphate and chloride of magnesium in drainage water; the potash in the soil decreases to one half, as do soluble salts in general.

Nevertheless, sodium bicarbonate tends to increase after irrigation, but this salt does not do much injury to vegetation.

It is especially in siliceous permeable soils that the removal of the salt is effected rapidly. The salts content falls from 2 to 0.3 %, which admits at once of the cultivation of berseem clover, followed by that of cotton.

RINGELMANN, MAX. **Reservoirs in Gardens.** (Les réservoirs d'arrosage en horticulture). — *Revue Horticole*, 84e Année, No. 9, pp. 211-213. Paris, 1er mai 1912. **1018**

In many small gardens, the water is drawn, carried and distributed by hand, by means of watering cans.

France

In order to reduce carrying, it would be well to make reservoirs not more than 100 ft. apart. In many cases, the distance is reduced to 65 and even to 50 ft.

All the reservoirs should be supplied by a chief reservoir, to which the water is brought either by a derivation channel or by an elevating apparatus.

The garden is provided with a main system of pipes to which each reservoir is connected by a branch, which can be cut off at will by a conical wooden plug wrapped round with linen, or by a stop-cock.

If the soil slopes more than 1 per cent. it is necessary for each branch to be provided with a stop-cock, which can be opened or closed according to the amount of water required. It is well to use a ball-cock, which closes the branch automatically when the reservoir is full.

The different pipes ought to be laid about 2 ft. deep to avoid freezing, and it is best to place them beneath the sides of the permanent paths or walks of the garden.

The pipes may be of metal (cast iron, iron, lead) or, which is cheaper, of earthenware (baked clay, glazed stone-ware) united at the joints with cement mortar.

The reservoirs are of earth, wood, or masonry.

The earthen reservoirs which are lined inside with a coat of clay cannot be recommended, as they take up too much room and make the drawing of the water difficult.

Barrels with the bottom removed can be used, or large barrels sawn in half and placed vertically upon the ground. These should be tarred, but not inside, since for some time empyreumatic substances from the tar are apt to get into the water used for watering.

Reservoirs of masonry with cement mortar are very solid; rough stone or, in preference, bricks are used, which allow of the reduction of the thickness of the facing. Reinforced concrete is an excellent material for such reservoirs and costs about 6*d* per cubic foot of capacity.

Metal (ordinary or galvanised sheet-iron) is not a good material for sunk reservoirs; it is only used for those above ground and there is a tendency to replace this substance by reinforced concrete.

Whatever system of construction is adopted, it is necessary, in order to facilitate drawing water by means of watering-cans, to make the upper margin of the reservoirs 12 to 16 in. above the soil level. The diameter of the reservoir should be between 2 ½ and 5 feet. The depth, which should not be too great, as this would be useless, can be limited to 3 ft. 3 in. or thereabouts.

1019 CALABRÒ, LEONARDO. **The Rational Irrigation of Citrus Trees for the Production of Green Lemons (Verdelli).** (L'irrigazione razionale degli agrumi per la produzione dei verdelli). — *L'Agricoltura Italiana*, Anno 38, Fasc. 720, pp. 261-264. Pisa, 16 maggio 1912.

Italy: Sicily

Irrigation is one of the necessary factors for securing a good crop of "verdelli" (1).

The operations must commence during the first ten days of August; if irrigation is begun before this date, bianchetti or maggiolini are produced which, on account of the season when they are gathered, suffer from the competition of the winter fruit which has been kept in storage depôts.

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(1) "Verdelli" are lemons obtained before the ordinary crop by forcing the trees by means of alternating wetness and dryness of the soil in late summer and autumn. They are green with the skin thin and smooth, and contain plenty of juice but few pips. They are always in demand and fetch good prices.

For *verdelli, bastardi* and *maggiolini* see ARNAO: *La coltivazione degli agrumi*, pp. 115-116. (Palermo, 1899). (*Ed*).

If the irrigation is delayed, the flowering is defective; this gives rise to fruits called *bastardi* or *malsani*; these come into competition with the first winter crop, being gathered only shortly before it, and the fruit fetches a lower price.

The water used in irrigation is obtained from reservoirs and brought to the orchards by small canals, which turn it into the trenches made between the rows of trees, whence it follows into the trenches dug round each tree. Part of the water irrigates the soil by infiltration between the lines of the trees, and the rest is used around the trunks.

Experiments have shown that trees which are to be forced, should, at the time of the beginning of vegetative growth, be watered much and frequently, irrespective of the nature of the soil.

The amount of water required per tree depends on the permeability of the soil, and on the state of the trees and the time of setting of the fruit. In the first five days two copious irrigations are made, and are followed by a thorough hoeing and the digging out of the basins round the trees. After this irrigations are made at intervals of 8, 10, 15 or 25 days. At the height of the flowering-time, irrigation is stopped till the setting of the fruit is finished; then it is carried out every 8 to 15 days.

Irrigations must always be made after sunset and up to a few hours before sunrise, so as not to disturb the circulation of water in the tree and make the fruit drop off trees standing in heated soil. Sometimes before the full irrigation, and always after dressing with chemical manures, a small quantity of water is run on to get the soil into the right state of moistness; this practice is not to be recommended.

The following table gives the results of some irrigation experiments made from 1906 to 1911 on two plots, each containing 25 trees, at Graniti in the Province of Messina:

		Amount of water used				Average crop of *verdelli*. (average of 5 years)	
		1st plot		2nd plot			
Number of irrigations	Date of irrigations	cub. feet per acre	gallons per tree	cub. ft per ac.	gallons per tree	1st plot	2nd plot
1.	Aug. 5th — 7th	9289	356	1143	44	856	325
2.	» 7th — 10th	7146	275	2000	77		
3.	» 10th — 14th	6431	246	2572	99		
4.	» 14th — 19th	6431	246	2858	110		
5.	» 19th — 26th	5716	220	2858	110		
6.	» 26th — Sept. 1st	5716	220	2858	110		

The two plots had the same soil and manuring and the trees were of the same age and at the same stage of development.

1080 RINGELMANN, MAX. **A Rain-Water Separator.** (Separateur d'eaux pluviales). — *Journal d'Agriculture pratique,* 76e Année, No. 21, p. 669. Paris, 23 mai 1912.

France

Rain-water for drinking purposes is generally conducted into a cistern after separation of the first portion which has served to cleanse the roofs and gutters.

The separation can be effected by means of the apparatus represented in Fig. 1, which has been specially devised by the writer as a rough structure, which can be easily made on the farm.

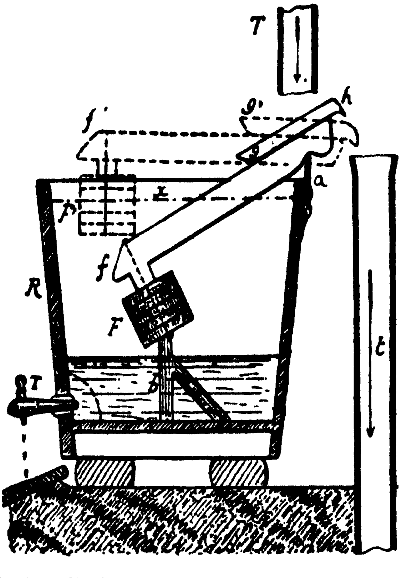

Fig. 1. — Vertical section through a Rain-water separator.

The water is conveyed from the roof by the pipe *T* and falls upon a zinc channel *hg* nailed upon a lever *f* revolving around a piece of sheet-iron *a* fixed to the barrel R; the extremity *f* supports a float *F* formed of sheets of cork, the further descent of which is prevented by the support *b*. At *r* there is a stop-cock, which allows the water to fall drop by drop and *t* is the pipe for the conveyance of the clean water to the cistern. The apparatus works as follows:

The first rain-water, which washes the roofs, falls by means of *T* upon *hg*, flows into the receptacle R, the capacity of which depends upon the surface of the roofs which feed the pipe *T*, and represents the volume of water considered necessary for washing them.

The level of the water in R rises, taking up with it the float *F* and, in the end, placing it in the position indicated by the dotted lines on the figure: *F' f' g' h'*.

At this moment the clean water which is brought by *T*, flows by *g'h'* into the pipe *t* and thence into the cistern.

The reservoir R empties itself slowly, in 24 hours, for example, by the stop-cock *r* protected interiorly by a grating which is cleaned from time to time.

TILLAGE AND METHODS OF CULTIVATION.

NÉMETH, PAL. **Dry Farming in Hungary.** (Kisérletek a Campbell-féle talajmüveléssel). — *Köztelek*, Year XX, No. 40, pp. 1441-1482. Budapest, May 25, 1912. **1021**

Hungary

In order to study the value of the Campbell system for Hungary, the administration of the Chapter domains on the banks of the Tisza caused some experiments to be conducted on the Kisfalud domains which are managed by the author and which represent nearly all the various types of soil to be found in those extensive properties.

The experiments were carried out on plots of the same extent and condition and were sown to barley, maize for grain and for forage, spring wheat (mixed with vetches), hemp, mangolds and chicory. A series of plots was tilled following Campbell's method, that is to say after an autumn ploughing the packer, disk harrow and drill were used.

The seeds on the plots treated according to Campbell's method sprouted a few days earlier than usual. Though the same amount of seed was used as on the plots cultivated on the old system, the seedlings appeared more uniform, closer together and more vigorous, which the author attributes to the compression of the soil favouring rooting.

The difference in the vegetation of the various plots, though very striking at first, ceased to be perceptible after the first abundant rain, on the plots under forage crops and cereals, but remained all the more marked in the hoed crops.

These latter, cultivated strictly on Campbell's lines, yielded 25 % more.

Considering these experiments, the author is of opinion that before adopting Campbell's system on light soils such as those of the Chapter domains, it requires further study, as the advantageous application of this system requires better soils. This mode of culture entails more team work on account of the somewhat slow work of the packer, which is a drawback to its use.

Besides, the actual profit obtained by the use of the packer is not proportional to the interest of the capital outlay which it renders necessary; it is probably for this reason at least in part, that the results of the Chapter domain experiments are not conclusively in favour of a more extended use of the packer.

The author is of the same opinion as the director of the agricultural academy of Debreczen, according to whom the use of the packer is not indispensable to the good cultivation of the soil. On the other hand, thanks to Campbell's method the practical value of the disk harrow and of the tooth harrow have been recognized. The disk harrow has diminished the injury which the drought 1911 would otherwise have caused. With it the author was able to prepare his land perfectly. With four harrows, three teams and three drills he was able to work 32 to 35 acres a day during the short autumn days.

MANURES AND MANURING.

1082

Manuring Problems in India.

The chief problems of manuring in India are as follows:

I. To determine the most economical manures available in India and to gain experience in their use.

II. The conservation and application of cattle manure (Ref. 1).

British India

I. — Economical manures for India.

In regard to the first problem an exhanstive summary was prepared for a special Committee of the Board of Agriculture in India from information which had been supplied by the provincial departments. The Board decided to accept the following points as reported by the Committee (Ref. 2).

Sheep manure. — The custom of folding sheep on the land is one which is widely adopted and extremely useful.

Waste organic materials. — It is of vital importance that everything possible should be done to encourage the application of waste organic material to the land.

Green manuring. — The practice of ploughing in a green crop as a fertiliser is of very great importance and should be strongly encouraged. It is not a practice which is applicable in all cases, and it requires judgment in order to be successful. In many districts it appears to be difficult to procure the necessary seed, so that the growing of seed of such crops, as carried on in Madras, should be encouraged. The use of green manures will also tend to replace the removal of leaves from the forests, which practice has become a serious danger to their existence in many districts. Another aid consists in the remission of water rates on land bearing a green manure crop, an arrangement which has been introduced in Punjab and Madras, and this should be brought to the notice of Local Governments. An extended study on the experimental farms to ascertain the best green manuring practices to meet local conditions is recommended.

Oil-cakes and fish-manure. — These two classes of material are considered together because they are not only highly nitrogenous organic manures, but are also similar in that they are largely exported from India. They are widely used as manures, more especially in Southern India, and their more general popularisation should be one of the most important functions of the Department of Agriculture.

Bones. — It is recognised that finely ground bones have proved serviceable and have repaid their application in certain places, for example to paddy land in Assam, Eastern Bengal, Madras, Bengal and the Central Provinces, and to coffee in Southern India. The most successful experiments have frequently been when the bone-meal has been used in conjunction with green manure. In view of the deficiency of phosphates in the soil over large parts of India, the question of the economical use of bones is recommended, in conjunction with green manures, as being worthy of the serious attention of the Local Agricultural Departments.

The quantity of bones annually exported from India is enormous, but the amount wasted is probably far greater. All this represents a terrible drain on the soil's resources, and to teach or persuade the people to conserve and use bones under proper conditions, is believed to do more lasting good to the country and at a lower cost, than encouraging the return in the form of superphosphates of the phosphoric acid annually exported in the raw form. Statistics show that during the years 1903-1908 the materials exported from India under the head of animal bones have averaged over 82 000 tons per annum (Ref. 3).

Saltpetre. — Attention is called to the low cost of potash in Indian saltpetre (Ref. 5).

Artificial manures : superphosphate, basic slag, etc. — With the exception of superphosphate, basic slag and sulphate of potash, which are used profitably in the planting districts of Southern India for coffee and rubber, the quantity employed is negligible, and it is felt that the question of their use in the future may suitably be left to the provincial departments who maintain tests of their value for general agricultural crops (cf. Ref. 4).

Finally the following points are particularly emphasised:

a) The results of experiments in the use of imported fertilisers seem to indicate that, as hitherto carried out, they have almost always shown a money loss; this would indicate that the methods of manurial experiment used up to the present need radical reconsideration.

b) The natural manurial resources of India being large and varied and not having received adequate exploitation up to the present, the attention of the various Departments is strongly drawn to the study of the value and conditions for the best use of indigenous manures.

c) Particular attention should be given to the rotation in any scheme of work designed to investigate manurial problems.

In this connection some points particularly bearing upon Eastern and North-Eastern India may be of special interest by way of illustration.

In a " Note on Fertilizers " (Ref. 3) appended to the Proceedings of the Board of Agriculture, the line of treatment to improve permanently the fertility of the soil occurring over large parts of North-Eastern India is sketched out, the following points amongst others been taken into consideration:

1. The nature of the soil as to the presence or absence of a sufficiency of calcium carbonate.
2. The climatic conditions of rainfall, etc.
3. The natural resources of the district.
4. The cost of the treatment proposed.
5. The permanency of its effects on the general agriculture of the tract.

6. The likelihood or otherwise of the possibility of abuse of the manures to be used, in unskilled hands.

The proposals are broadly:

a) for tracts of soil deficient in calcium carbonate and acid in character, the use of some form of lime, some form of phosphoric acid, and organic matter containing nitrogen;

b) for soil alcaline or neutral and having a sufficiency of calcium carbonate, the addition of some form of phosphoric acid and organic matter containing nitrogen.

As to the nitrogen problem the following specific rotation is considered, merely as an example:

1st year { Rains crop — green legume to be ploughed in.
Rabi crop — mustard

2nd year { Rains crop — « aus » paddy
Rabi crop — oats

Calculating the total crop (mustard, grain 500 lbs., straw 600 lbs.; oats, grain 1 200 lbs., straw 2 000 lbs.; " aus " paddy, grain 2 000 lbs., straw 2 400 lbs.) and drainage removals of nitrogen, as well as the nitrogen supplies of the green crop (*Sesbanea aculeata*, " dhainka " — 14 tons) and of cow manure (100 mds. per annum), the balance sheet per acre works out as follows (cf. Ref. 6):

Soil's nitrogen account.

	lbs. nitrogen		lbs. nitrogen
To green crop, nitrogen obtained from air. . .	70	By crop removals. . . .	70
To cow manure	80	By drainage removals. .	60
		Balance	20
	150		150

This leaves a balance of 20 lbs. nitrogen, and the position would be still better with other rotations.

II. — THE USE OF CATTLE MANURES (Ref. 1, 2).

This leads to the second problem, that of the conservation and application of cattle manure. The conservation and application of cattle manure (in which are included all kinds of organic matter in the way of straw and rubbish which goes to make a manure heap) is a subject of the utmost importance to India. A very large amount

(3) MEGGITT, A. A., *Agric. Chemist*, and BIRT, A. G., *Dept. Director o Agriculture Eastern Bengal and Assam.* Subject V: — Note on Fertilizers. — *Ibidem*, App. C., pp. 66-71.

(4) Manures. Statement containing the report on the manures available and the experience gained in their use in Agricultural Stations of Bengal. — *Department of Agriculture Bengal. Quarterly Journal*, Vol. V, No. 3, pp. 143-145 Calcutta, January 1912.

(5) See *B.*, Jan. 1912, No. 57.

(6) MOLLISON, J. A. Text-Book of Indian Agriculture, *passim*.

Fertilisers in Japan.

Up to 1910 the fertilisers situation in Japan was as follows: **1028**

Japan

Production.

		1906	1907	1908	1909	1910
Phosphate rock. .	tons	3 091	1 694	728	3 872	1 042
	£	1 880	755	745	799	916
Chloride of potash	tons	—	—	—	466	672
	£	—	—	—	3 899	5 010
Sulphate of ammonia	tons	—	—	—	825	1 100
	£	—	—	—	11 533	18 562
Fish manures. . .	£	700 209	874 360	773 353	697 003	758 812

Imports.

		1906	1907	1908	190	1910
Sulphate of ammonia	£	540 262	839 202	897 273	604 198	924 710
Phosphâtes. . . .	£	396 713	397 826	341 798	226 451	488 322
Oil-cakes.	£	1 574 385	2 146 296	2 496 980	2 491 548	2 028 569
Nitrate of soda. .	tons	4 930	4 104	5 122	—	—
Bones and bone-meal	£	198 002	201 670	—	—	—

Sale.

		1906	1007	1908	1909	1910
Animal fertilisers.	£	832 177	892 306	718 520	675 885	769 618
Vegetable fertilisers	£	538 995	663 010	709 693	662 471	776 911
Mineral fertilisers.	£	472 062	687 559	612 582	700 156	746 940
Compound fertilisers	£	670 263	1 186 478	930 485	981 100	1 240 746
Total sale . .	£	2 518 036	3 430 064	2 973 345	3 020 946	3 537 027

At the end of 1910 there were 20 256 licensed artificial fertiliser manufacturers, 543 importers, 403 transit-traders and 37 690 dealers.

A feature of Japanese agriculture is the cultivation of " genge " (*Astragalus sinicus* L.) for green manure to crop fields. According to the returns by the Agricultural Societies (exclusive of Formosa and Okinawa) the average percentage area occupied up to 1906 by green manure was as follows:

One crop field (paddy)		61.0
Two crops field	rice, barley	32.2
	green manure	6.8

Other crops are cultivated for green manure, as soy bean, clover, two legumes — " soraname " and " endo " —, and others.

" Genya " are weed lands mostly on high places, which, owing in all probability to lack of communications, are chiefly utilised to obtain grasses for fodder and green manure. They contribute a great deal toward the supply of fertisers. According to the returns made by the Department of Agriculture and Commerce in 1903 the total area (exclusive of the Hokkaidò, Formosa and 10 prefectures) was 3 451 890 acres, the area devoted to green manure being 1 176 973 acres, 34.09 per cent, and with an average output of 62 ½ cwt. per acre.

The total returns for green manure crops in 1910 are as follows:

Sown in spring	paddy fields	986 525 tons	(367 376 acres)
	upland fields	63 446 »	(18 154 »)
Sown in autumn	paddy fields	2 484 047 »	(472 240 »)
	upland fields	110 188 »	(22 462 »)

Further, a practice employed from early times is to improve physical conditions of soils by applying sand to clay soils or clay to soils rich in humus. Burning is also applied to lands containing an excess of organic matter. In cultivating forests and plains, the roots of trees and grasses are burnt for manure. In a few districts furnaces are constructed to burn soils, which are employed as manure.

Lately the fertilisers situation has developed great importance, the value of the imports for 1911 amounting to £ 5 248 700 or over 10 per cent of the total value of imports. The increase over 1910 amounted to no less than £ 1 379 300, which was more than the gain made by any other group of imported articles.

The advance in sulphate of ammonia was large, being £ 155 300, but it was far surpassed by the very big increase in bean cake of

£ 849 600, *viz.* from £ 1 735 400 to £ 2 585 000, this latter figure being the record up to the present. There were also considerable gains in phosphate rock (£ 155 000), nitrate of soda (£ 135 900), rapeseed and cotton-seed cake, fish cake (sardine, herring, whale), fish guano; while the only items showing decreases were dried blood, animal bones and superphosphates.

The figures for nitrate of soda show a very large increase. It is thought by experts that there is bound to be a continued increase in the imports of nitrogenous materials in the future, as not only are the home supplies not expanding at the same pace as the demand, but some of them, notably those obtained from rape seed and fish, are actually decreasing. Both sulphate of ammonia and nitrate of soda are likely to share in this increase. The inland output of sulphate of ammonia is increasing, and the " Nippon Chisso Hiryo-Kabunshiki Kaisha » (Japanese Cyanamide Company) is increasing its premises, building a new factory more extensive than that now working.

SUMMARY.

I. — A special feature of Japanese agriculture is the extent given to green manuring.

II. — With the progress of Japanese agriculture, however, artificial fertilisers will partly supersede organic fertilisers.

III. — Fish manures and oil-cakes especially will be, partly at least, superseded by chemical nitrogenous fertilisers.

IV. — A Japanese fertiliser industry has been developed, and superphosphates, sulphate of ammonia and calcium cyanamide are produced.

V. — There is an increased demand for nitrogenous materials to be partly met by an increased importation of nitrate of soda and sulphate of ammonia.

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(2) MINISTÈRE DES FINANCES. Annuaire Financier et Economique du Japon, XIme A., *passim*. Tokyo, 1911.

(3) Twenty-Seventh Statistical Report of the Department of Agriculture and Commerce, Japan, *passim*. March, 1912.

(4) RAINERI, L. Il problema dell'azoto come è oggi, *passim*. Piacenza, 1909

(5) SOCIETÀ GENERALE PER LA CIANAMIDE. Relazione del Consiglio di amministrazione. Roma, 1912.

(6) CROWE, E. F. (H. M. Comm. Att. at Yokohama). Japan, Fertilisers. — *The Board of Trade Journal.* pp. 445-447 (446). London, May 30, 1912.

1024 DESPREZ. F. **The Maximum Limit of the Use of Chemical Manures.** (Gros rendements obtenus sans fumier. Ferme pour la production des céréales et des fourrages). — *La Vie à la Campagne*, Vol. XI, No. 135, p. 275. Paris, 1 mai 1912.

The farm studied presents an extreme case of intensive cultivation based on the use of chemical manures, and thus is a typical case; at least 500 acres of this farm have received no dung since 1870. France

The rotation practised was seeds, cereals, seeds, roots. The seed-lea replaced the dung by supplying the soil with the organic substances necessary for nitrification and the assimilation of manures. The rest of the nutritive substances were given in the form of chemicals. A practical idea of the system is afforded by the amounts of manures applied to the cereals in the rotation in 1909.

Grain crop	Area: acres	Cultural conditions	Season of application	Manures applied: cwt. per acre				
				super	chloride of potash	sulphate of ammonia	gypsum	nitrate of soda
Wheat . .	30.6	after crimson clover and fallow	autumn	3.8	0.5	1.0	2.6	—
Wheat . .	30.6	after sainfoin . . .	autumn	3.8	0.5	1.0	2.6	—
Wheat . .	27.7	after oats on broken-up lucerne lea . .	autumn	3.8	0.5	1.0	2.6	—
			spring	—	—	0.5	2.6	0.5
Wheat . .	82.7	after wheat	autumn	4.5	0.6	1.3	2.6	—
			spring	1.9	0.25	0.3	2.6	0.3
—	30.6	after wheat following wheat . . .	autumn	4.5	0.6	1.7	2.6	0.3
			spring	1.9	0.25	0.5	2.6	0.5
Rye . . .	3.0	—	autumn	3.2	0.5	1.0	2.6	—
Oats . .	84.2	with lucerne and sainfoin sown under.	spring	3.8	0.5	0.6	2.6	0.6
Oats . .	50.6	alone	spring	—	—	1.0	—	1.0

With these dressings the average cost was 42*s.* per acre for wheat and 30*s.* for oats as nurse for seeds, which can bear a fair amount of the expense.

The corresponding products are the following:

Cereals —	Area acres	Total Crop tons	 bushels	Crop per acre: bushels
Wheat	202.2	205	7 380	36.7
Oats	134.8	148	6 875	50.1

It is found, on comparison with rotations based on sugar-beets, that putting leguminous crops (lucerne, sainfoin or clover, according to the soil) instead of beets at the beginning of the rotation, it is possible to do without dung, by making a maximum use of chemical manures, the profits not being considered.

BOCHER, H. **Utilisation of City Refuse.** (Utilisation des détritus des villes. *Comptes Rendus de l'Assemblée Gén. de* 1912, 2e *Fasc.*). — *Bulletin de la Société des Agriculteurs de France, Supplément au Bulletin* du 15 mai 1912, pp. 686-688. Paris, 1912. **1025**

France

This work was awarded the agricultural prize for 1911 by the Section of International and Colonial Relations of the Society of Agriculturists of France. The Author examines into the question of the utilisation, from the agricultural point of view, of town refuse, from the standpoint both of health, of municipal finances and production of fertilisers.

Of considerable practical interest will be found the following conspectus of the various systems adopted by great cities in different countries for the disposal of household refuse, with particular regard to those of greater value to agriculture.

In France, Paris had first adopted the process of incineration and subsequent grinding, but has of late replaced it by a mixed system which would seem to be more in keeping with the wishes expressed on the point by the Society of Agriculturists of France. The system consists in grinding the refuse and dividing it up into two parts to be used in different ways: there would thus be on the one hand a fertiliser in dust form, the value of which, quantity for quantity, would be double that of farmyard manure, and on the other, briquettes for fuel.

England

In England, although the system of incineration appears more practical, it is not yet generally adopted. The very divergent local practices, though primitive and anti-hygienic, are still adhered to. There are exceptions, however; thus in Hastings, Southampton and other cities incineration has been adopted, and the energy and heat produced are used for various industrial purposes. Generally, however, the refuse is only removed every other day.

Belgium In Belgium, at Brussels incineration has been adopted. At Liège, on the other hand, the refuse is piled up in heaps 500 yards in length. After each discharge of refuse, lime-water is spread over the mass, this operation being repeated at the end of each day. Thus rapid oxidation takes place and the refuse, reduced to a condition of great subdivision, is converted into excellent manure which is sold to farmers.

Germany In Germany, at Berlin the refuse is carried away by contractors under contract with householders; it is carted a distance of at least 25 miles from the city, being used to fill up old excavations or peat mosses. At Charlottenburg on the other hand the refuse is separated into three parts by the householders themselves: kitchen refuse, rags and fuel refuse (ash and slag). The first material is sold for fattening pigs, the second is purchased by rag dealers and the third is thrown away. Cologne and Frankfort have the refuse carted outside the city by contractors, to be used by farmers. At Dresden a questionable system is in use: each house has a large brick-built bin into which the refuse is discharged, being removed thence every three months by a contractor selected by the householder. In Munich finally, the refuse is separated in a special establishment.

witzerland In Switzerland, at Zurich and Geneva preference is given to incineration; the refuse is used on the one hand for fertilising and on the other for road upkeep.

Austria In Austria a system has been organised of transporting the refuse to places of deposit outside the town.

America In America the separation of refuse into several classes is likewise carried out: street sweepings, ash, kitchen refuse, house sweepings. These materials are not carried away on the same day, and they are put to different purposes. In several cities fatty substances suitable for various uses are extracted from them, while in others they are incinerated, producing energy and heat for industrial purposes.

1026 Manurial Value of some Ashes of Different Origins.

Canada

(1) Shutt, F. T. Crematory Ashes. *Experimental Farms, Report of the Dominion Chemist*, p. 192. Ottawa, 1911. (App. to the Report of the Minister of Agriculture).

(2) Do. Ashes from Refuse Paper, Sweepings, etc. — *Ibid.*, p. 193.

(3) Do. Wheat Straw Ash. — *Ibid.*, pp. 193-194.

A series of analyses and valuations as manure of some ashes originating from the disposal of three different descriptions of refuse:

1. *Ashes from animal residues.* From the analysis of this product obtained from the city of Vancouver, B.C., the following data result:

	Fertilising constituents %
Nitrogen	0.041-0.087
Phosphoric acid	1.40-1.81
Potash	0.92-1.27
Lime	19.74-19.90

The contents of phosphoric acid and potash give a certain value to this product as manure. It is the lime, however, mostly carbonate, which imparts special value to the product, rendering it a useful corrective for drained lands, and peaty and heavy soils deficient in lime. Some fluctuations are to be noted however, as appears from the following comparison:

	Lbs. per ton.	
	1896	1910
Phosphoric acid	26-233	28-36
Potash	35-43	18-25

The greater contents of phosphoric acid of the 1896 product are due to a larger proportion of bones in the incinerated refuse.

2. *Ashes from refuse paper, sweepings,* etc. Analysis of the ashes from paper, sweepings, etc., from a large educational establishment, which may be regarded as typical of materials of the like origin:

	%
Nitrogen	0.17
Phosphoric acid	0.34
Potash	0.64
Lime	4.87

This indicates a very low fertilising value, but the product may, if necessary, be used for the sake of its contents of lime.

3. *Wheat straw ash.* On large areas in the north-west provinces of Canada the only practicable method of getting rid of the large quantities of straw produced is to burn it, either in large heaps or as fuel for threshers. This involves a considerable loss not only of organic but likewise of mineral substances. As a matter of fact in the analysis of a product from the Province of Alberta the following data are obtained:

	%
Organic and volatile matter (chiefly carbon)	17.95
Mineral matter insoluble in acids (chiefly silica)	76.39
Oxides of iron and alumina	0.64
Lime	0.39
Magnesia	0.37
Potash	4.06
Phosphoric acid	0.19
Indeterminate	0.01

It is evident that the product possesses a certain fertilising value, especially owing to its contents of potash; but the latter being in the original straw 10-15 %, there is nevertheless a noteworthy loss of this useful substance both by volatisation during burning and through its being washed out by the rain.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

1027 TRUE, R. H. and BARTLETT, H. H. **Absorption and Excretion of Salts by Roots, as influenced by Concentration and Composition of Culture Solutions.** — *U. S. Department of Agriculture, Bureau of Plant Industry, Bull.* No. 231, pp. 36 + figs. 21 + Tab. VIII. Washington, 1912.

United States

In the course of work carried on some years ago by R. H. True, the change in salt concentration of culture solutions in which *Lupinus albus* was grown, was followed by means of the method of electrical conductivity. The results indicated that lupin roots when grown in distilled water excrete electrolytes which render the water conductive, and a better medium for the growth of a second set of seedlings.

This has led the Authors to use the conductivity method in studying the influence of concentration on absorption and excretion of salts by roots of plants growing in dilute culture solutions. This Bulletin reports the results of a series of experiments with field peas grown in very diluted solutions of calcium and magnesium nitrates $\left(\frac{N}{5\,000} \text{ to } \frac{N}{500\,000}\right)$.

These researches will be followed by others, but the preliminary results that have been obtained are of great interest for both the theory and practice of agriculture; they may be summed up as follows:

1. There is a definite concentration for each salt or mixture of salts at which the roots of peas absorb and excrete electrolytes at the same rate.
2. If a culture solution is initially less concentrated than this equilibrium concentration, excretion from the roots overbalances absorption.
3. If instead a solution is relatively more concentrated, absorption overbalances excretion; and this absorption may diminish the concentration beyond the limit of equilibrium.
4. This diminution depends, in the case under consideration, upon the ratio of magnesium to calcium.
5. The ratio, expressed in molecular weight, which favours maximum absorption is $\frac{1}{1}$.
6. The ratio of magnesium to calcium which insures good development of pea roots is $\frac{9}{1}$, if the solutions are so concentrated that their magnesium content alone would prevent the development of lateral roots.
7. This ratio is nearer $\frac{99}{1}$ if the solutions are so diluted that the magnesium content alone would not inhibit the development of lateral roots.

SELECTION.

1028 D'Ippolito, G. **Determination of Germination Energy of Seeds according to the Average Time required for Germinating.** — (Determinazione dell'energia germinativa dei semi in base al tempo medio di germinazione). — *Le Stazioni Sperimentali Italiane*, Vol. XIV, Fasc. 4, pp. 302-320. Modena, 1912.

Italy

The valuation of the germination energy based on the number of seeds which sprout within an empirically fixed lapse of time can not (owing to the irregular course of the germination curve for seeds of the same or of distinct varieties) give a clear idea as to the value in this respect of a parcel of seed.

It often happens that a high germination capacity is accompanied by low germination energy and that the answers furnished by different laboratories to the same questions differ so widely as to give rise to complaints on the part of the purchasers of seeds. In order to avoid this inconvenience, the Author, agreeing with H. Pieper (cf. *Keimversuche mit Grassämereien* : Dissert. Jena, 1909), proposes that germination energy be determined not on the basis of the percentage of seeds which sprout within a determined time, but on the mean time required for germination, and that it be designated by a number which represents its value exactly.

Supposing for instance that a sample on being tested for germinability had given the following results:

After	3	days	15	seeds	germinated
»	4	»	50	»	»
»	5	»	20	»	»
»	8	»	8	»	»
»	10	»	2	»	»
			95		

Then adding together the respective products of these figures, *viz.* $3 \times 15 + 4 \times 50 + 5 \times 20 + 8 \times 8 + 10 \times 2 = 429$; and dividing this sum by the total number of sprouted seeds, $\frac{429}{95} = 4.5$ is obtained. Then the results of the germination would be stated as follows:

Germination capacity	95 %
Mean germination time	4.5 days

With these two figures the seed is sufficiently characterized as regards its germination capacity. The difficulty of choosing a convenient term for expressing germination energy is avoided, as well as all those discrepancies among the results given by various laboratories, and which with the methods actually followed are almost inevitable.

The Author gives the results of numerous experiments made with the object of determining the mean average time required by the seeds of the most important crops. The following are the conclusions arrived at:

White Clover. — Of 48 samples tested 4 only gave 3 days, 24 between 3 and 4 days ; 16 between 4 and 5, and only 4 above

5 days. The two first samples (mean germination time, M.G.T. = 2.07 and 2.63 days), considering also their high germination capacity, 89 and 87.5 % respectively, may undoubtedly be considered of excellent quality. The same cannot be said of the next two, which, though they posses a high M. G. T. (2.63 and 2.76 days), show a very low germination capacity (50 and 56.5 % respectively), due to a high percentage of hard seeds. Those seeds that have M. G. T. between 3 and 4 days, excepting those which on account of their low germination capacity appear to be old, may be considered as being of good quality.

It is the same with seeds when their capacity is a trifle below 70 %, as it is due in this case also to a high percentage of hard seeds. The other samples whose M. G. T. is above 4 days and whose capacity ranges within rather low limits, may in general be considered as seeds in which the two principal qualities are beginning to be enfeebled by age, and should be classed as inferior.

Summing up, the limits between which M. G. T. may range for good white clover seed are 3 and 4 days.

The cases which combine a high capacity of germination and an M. G. T. inferior to three days are considered exceptional. In this species the germination capacity is almost completely exhausted in 7-8 years, but during the first years its decrease is not very rapid, nor is any increase in its germination capacity at all frequent. Therefore the seeds of the current and of the previous year are to be preferred.

Red Clover. — From data relating to red clover seeds it appears that of 59 samples tested, 49 gave the M. G. T. between 3 and 4 days, together with a high degree of germination capacity. Only in a few cases was less than 80 % reached, here also owing to hard seeds. The limits between 3 and 4 days may be considered as indicating good seed.

This clover does not show great resistance to the action of time, but its germination capacity is fairly steady during the first 2 or 3 years. In the year following the harvest and sometimes also in the next the seed seems often to improve, and this is explained by the natural reduction which takes place with time, in the number of hard seeds.

Crimson Clover. — This clover does not long keep its germination capacity, which diminishes considerably, if not completely disappearing, in 6 or 7 years. During the first years, however, this diminution is not very rapid, but contrary to what happens to the seed of the two preceding species, an increase of this capacity is never observed. This clover attains a high germination capacity and the maximum of this capacity is found together with the most different mean germination times, excepting with manifestly old seed, in which the capacity is very low. Anyhow the limits within which the mean time for good seed may range are 3 to 4.5.

Lucerne. — This species keeps its germination capacity longer than clovers, and after 5 or 6 years it is still fairly high, and during the first years cases of increase of capacity are somewhat frequent, though those of decrease prevail.

Nevertheless it is always preferable to sow seed of the current or of the preceding year. As in the tests made on 60 samples, the M. G. T. in 52 cases was between 3 and 4 days, these limits may be considered as an index of good quality of seed.

Sainfoin. — In this species also the maximum germination capacity is found associated with extremes of M. G. T. and this is explained by the fact that the capacity never increases by keeping. Sometimes it decreases slowly, but more often rapidly. Hence the practical rule of only using seed of the current year.

The M. G. T. is between 3 and 5 days.

Sulla (*Hedysarum coronarium*). — The germination capacity is retained well for some years, but decreases considerably and sometimes disappears after 7 or 8 years. In the first two or three years it remains unaltered and even increases and it may be considered advantageous to keep it for a year. The M. G. T. indicating good germination is between 3 and 5 days.

Bird's-foot trefoil. — In this species the percentage of hard seeds is high, often above 50, and keeping appears to have some effect upon them.

It is due to these hard seeds that a high germination capacity is found also after 7 or 8 years. The M. G. T. lies between 4 and 6.

Fenugreek. — This species possesses a high germination capacity, often attaining 100 %, which it keeps for several years. Its M. G. T. is between 3 and 4.25.

Vetches and Maize. — The same as for Fenugreek.

Ryegrass. — In this species, the germination capacity decreases, though moderately, even in the first years of storage, and disappears completely within 8 or 9 years. Its M. G. T. is rarely less than 4, usually between 4 and 6.

Wheat. — Wheat not only keeps its germination capacity, but generally perfects it during the year following the harvest. After the third year, while the capacity is still high, the energy diminishes considerably. It follows that there is some advantage in storing it for one year after the harvest, but not for longer periods.

The limits within which the M. G. T. may range are 4 and 5.

Oats. — This species possesses in general less germination energy than wheat and with the exception of some varieties its M. G. T. is between 4 and 6.

Rice. — Rice possesses in general a high germination capacity, which however diminishes considerably and disappears completely within a few years. Considering that of 51 samples tested the majority required M. G. T. of between 5 and 6.5, these limits may be taken as indicating a good quality seed.

Hemp. — In this species germination energy decreases rapidly from year to year. The capacity diminishes also from the beginning of its storage and is completely lost within 7 or 8 years. Hence in practice fresh seed is preferred. Hemp has a high germination energy and its M. G. T. lies between 3 and 4.

Beetroots. — Beet seed preserves its germination capacity almost intact during the first two or three years.

After the third year, though its capacity remains high, its energy decreases notably, and after the fourth year the capacity also decreases. The M. G. T. for good seed varies from 4 to 6.

WOHLTMANN, F. **Methods of Work followed at the Plant-Breeding Experiment Station attached to the Agricultural Institute of the University of Halle.** (Arbeitsmethoden u. neuere Apparate der Pflanzenzuchtstation des Landwirtschaftlichen Instituts der Universität Halle a. S.). — *Kühn-Archiv,* Band 2, pp. 231-272. Berlin, 1912. **1029**

The results of the selection investigations conducted at the Experiment Station attached to Halle University are here given.

Germany

The following methods were adopted according to the type of material used:

A. Selection based on anatomical and physiological characters when dealing with not very uniform material.

Thus for instance the process followed to improve the Siebenbürger Landweizen (wheat) consisted in selecting 10 000 of the finest and heaviest grains, which were sown separately by means of a special apparatus.

At harvest time the best developed plants were selected and, after being submitted to numerous measurements, were divided into three groups:

I Red bearded Siebenbürger.
II White bearded »
III Spotted beardless »

From these groups the choice (élite) individuals were again selected, namely those that for the shape, volume and weight of ear, uniformity of haulm and degree of tillering answered the purpose of breeding.

For autumn sowing it is always advisable to have a sufficient quantity of choice seeds so as to allow for the inevitable losses caused by frost, snow, etc.

The descendants of the various groups will be again examined and only the best will be kept for further breeding.

B. Continued individual selection generally forms the continuation of the previous method; it consists in a yearly selection of the choice (élite) plants in pure lines. Under the term pure lines are designated all individuals descended from one antogamous homozygous individual. Johansen considers individual selection a means of isolating the best types that compose a population, and nothing more. Selection cannot cause genotypical differences.

The author, however, believes that critical conditions of environment (extreme changes in soil or climate) might produce transmissible variations in pure lines also.

C. Selection of mutations. In general not much importance is attached to this method; and certainly when it is a question of the presence or absence of beard, hairs, etc., not much is to be expected.

That there are, however, some mutations which from the breeder's point of view may be very important is proved by the breeding of a late line mutation from the early summer wheat Wohltmanns Kinney.

In 1909 a selection of ears was made in the field from Kinney's Line, II stock (mother plant isolated in 1903). Among the descendants of this ear, stock 15 (1909) ripened three days later than the other stocks.

It is not a product of splitting up but is quite stable and resembles in habit early Kinney types, differing only in not being so early and in the greater weight of the grains.

D. Selection with hybridization.

Experiments will be commenced only in the current summer.

1000 CHRISTIE, W. **Investigations on the Native Varieties of Oats in Norway.** (Untersuchungen über alte Norwegische Hafersorten). — *Fühlings Landwirtschaftliche Zeitung*, 61. Jahrgang, 9. Heft, pp. 297-313. Stuttgart, Mai 1912.

Norway In Norway, where the inclement weather and the shortness of summer are natural obstacles to the acclimatisation of crops from southern countries, the improvement of the old native varieties, lacking in fineness, but well acclimatised, constitutes one of the problems of the utmost importance and practical interest.

To this matter have been directed the studies and the investigations of Christie (Jyellum, Norway) on about 30 types of native oats classifiable under two varieties: white and grey. *White Oats* have a mediocre growth, limited foliage and a thin culm with abundant tillering. The colour of the grain is predominantly white, with a rather plump and short shape, the sides practically parallel; the spikelets have two or three grains. It rarely has two awns, generally a single one poorly or greatly developed; awnless specimens are rare. The bulk of the grains is considerable; only two types with small caryopses were observed.

Grey Oats present a vigorous growth, with extensive leaf bades, strong culms, but little tillering. The colour of the caryopsis is grey; it is elongated and pointed in shape, the base of the glume being covered with long hairs. The spikelets have two or three grains, and two awns, very seldom more. In various types elongated spikelets occur with 3 to 6 caryopses.

We reproduce the following table of particulars:

	Number of days from sowing until		Weight of 100 plants	
Name of type —	appearance of inflorescences	ripening —	grain in gr.	straw in gr.
White Norwegian Oats:				
Snaasen	55	98	443	622
Grue	52	94	224	272
Trönder	59	104	220	405
Grey Norwegian Oats:				
Nordland	48	88	211	304
Egeland	58	107	395	680
Grey Danish Oats:				
Grey Oats	62	124	285	515

The proportion in grain of the native varieties of Oats is therefore very high, in some types exceeding the selected Danish varieties. What renders them valuable above all, however, under the special climatic conditions of Norway, is the shortness of the period of growth, which is reduced in the Snaasen type to 98 days (from sowing to ripening), nearly a month less than the Grey Danish Oats (124 days) usually regarded as a very early variety.

1081 NEIBERG, B. **Selection of Varieties of Maize for Cold Countries.** (O Postanovkie Opêtov s Sernovoi Kukurusoi na Sievierie). — *Selskii Khosiain* (The Farmer), No. 24, pp. 1330-1332. S. Peterburg, 13 Apriel 1912.

Russia

B. Usovsk, on the basis of climatological and agro-geological considerations, marks out the northern limit of the possibility of maize cultivation in Russia along a belt passing beneath Nizhnii Novgorod and Tula and traversing the Governments of Kaluga, Moghilev and Ryazan. The extension of maize-growing northwards up to the above boundary presents a problem of the utmost interest to Russia.

The results are given here of many observations and enquiries into the selection of early varieties such as can thrive and ripen their fruits within the close limits set by the favourable period of local weather conditions.

Last year, the summer in Elisavetgrad (Kherson) was extremely wet and cold, with an average temperature two degrees below the normal, and corresponding to the mean summer temperature at the northern limits of the zone of distribution of maize according to Usovsk.

Notwithstanding this, several varieties reached complete maturity — Will's North Dakota White, North Dakota Yellow, Will's Jehu— and ripened within 15 weeks from sowing (with sunshine for less than 7 out of 24 hours).

Among the varieties which matured in 17 weeks there are reported Bieli Korogl Filipp (White King Philip), Cinquantino, Quarantino, Motto, Motto Rosso and Mercier.

The varieties harvested after the frosts of the 13th September (which marked the limit of the active temperatures) yielded grain of a more or less keeping quality but not fully ripe. Its ripening would have required at least another week of sunlight, and the total duration of the vegetative period may therefore be fixed at 19-20 weeks.

Among the most important varieties we note: Early Yellow Canada, Dakota Sunshine, Browncounty, Minnesota No. 13, Pride of the North, King of the Earliest, Silver King and Liming (acclimatised). Leaming Dent, Silver Mine and Reid's Yellow Dent had, on the onset of the low temperatures, not yet emerged from the phase of milky ripeness and the grains therefore would not keep. The late varieties are therefore a week behind the earlier ones in ripening; it is hence impossible to grow the varieties Dakota Sunshine and Minnesota No. 13 at Tula and in the other northerly Governments of the belt marked off by Usovsk. It is necessary there to keep to the low production varieties (2163 to 2709 lbs. per acre) not very early: Will's Jehu, North Dakota White and Yellow; Mercier, Motto and King Philip being reserved for the central regions, and Sunshine, Browncounty and Minnesota No. 13 for the more southern regions of the zone.

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ALVES. **On the Yields of Clovers from Different Countries grown in Denmark.** (Berichte über Klee-und Grassamenzüchtung und Samenbau im Ausland). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Nr. 21, pp. 304-305. Berlin, 25. Mai 1912.

Denmark

The results are given of selection and control experiments carried out upon different species of clover and due to the initiative of the Danish Agricultural Society.

The experiments were made at six stations, and during the two periods 1877 to 1896 and 1900 to 1906.

Alsike (Trifolium hybridum). — This clover is distinguished by its large yield of hay. Seed from Germany and Bohemia produced an average of 2 ½ to 3 cwt. per acre less than Swedish seed. The same can be said of seed from Russia and Kurland. That coming from the Rhine Provinces and England, however, much resembled the Swedish in its hay yield. American seed gave the worst results.

Yield of hay from alsike from different countries.

Stations of Observation :

Orslev, Tystofte, Lyngby and Askov-Lehmboden

Country of Production	No. of trials	Cwt. per acre				
		First year's crop			Second year's crop	Crop of the two years
		1st cut	2nd cut	total		
Period 1880-1886						
Sweden	19	23.6	8.0	31.7	18.2	50.0
Rhine Provinces	14	22.1	8.4	30.6	18.2	48.8
Germany	15	20.3	7.8	28.1	17.0	45.1
England	8	24.1	9.4	33.5	15.9	49.5
North America	13	17.3	7.9	25.3	14.3	39.6
Period 1900-1906						
Sweden	11	28.6	5.0	33.6	23.2	56.9
Germany	11	26.7	4.6	31.4	22.7	54.2
United States	11	22.8	4.6	27.3	21.5	48.9
Canada	11	22.0	4.2	26.2	20.2	46.5

White Clover (*Trifolium repens*). — The largest hay crop was obtained from Danish seed coming from the islands. Seed from Russia had the advantage of producing an early crop, but the yield was 1 ½ to 3 cwt. per acre less than that obtained from Danish seed. Seed from Germany, Bohemia and Silesia produced both years 7 cwt. per acre less than the native clover. Dutch, American and English white clovers are of little importance on the Danish market.

"Lodi" Italian white clover is late; it has very large leaves and is more luxuriant and productive than any other type, but the crop is not always certain in Denmark. Also, the seed is dear and difficult to obtain.

Yield of hay from white clover obtained from different countries.

Country of Production	No. of trials	Cwt. per acre: First year's crop: 1st cut	2nd cut	total	Second year's crop	Crop of the two years
Period 1880-1896						
Denmark	18	17.8	5.8	23.6	10.4	34.1
Italy	7	10.5	8.6	19.1	12.7	31.8
Holland	9	14.4	7.3	21.7	9.6	31.3
America	7	12.5	6.5	18.9	11.7	30.6
Pomerania	14	15.1	5.4	20.4	8.9	29.3
England	9	14.9	4.8	19.7	7.1	26.7
Germany	16	14.4	4.3	18.7	7.8	26.5
Period 1900-1906						
Denmark	12	25.7	6.5	32.2	18.4	50.6
Russia	9	23.3	5.6	28.9	18.2	47.1
Bohemia and Silesia	9	21.5	5.0	26.5	17.9	44.4
Germany	8	22.7	4.4	27.1	16.7	43.8

Trefoil (*Medicago lupulina*). — The number of the experiments was limited. Seed from Belgium and Western Germany yielded 3 to 3 ½ cwt. of hay per acre less than the French type.

Seeds of an annual variety of white clover from Hungary, Italy and Silesia were also observed; this plant however proved worthless for forage.

FINLOW, R. S. and BURKILL, I. H. **The Inheritance of Red Colour, and the Regularity of Self-Fertilisation in *Corchorus capsularis*, Linn., the Common Jute Plant.** — *Memoirs of the Department of Agriculture of India, Botanical Series*, Vol. IV, No. 4, pp. 73-92. Calcutta, March 1912. **1088**

The many races of jute (*Corchorus capsularis*) cultivated in India may be grouped under the following colour types:

(*a*) deep red stem, petioles and fruits, with the teeth of the leaves also tipped with red;

(*b*) brownish red stems, petioles and fruits, with no distinct red borders to the leaves;

(*c*) green stems, with reddish petioles and fruits;

(*d*) pure green stems, petioles and fruits.

British India

The tints of the various red races contained in groups (*a*), (*b*) and (*c*) were not exactly identical, but rather formed a series of colour gradations between the extreme types pure red and pure green. The red colour is a soluble pigment which is found:

1) chiefly in the brick-shaped parenchyma cells, which lie immediately under the epidermis of the stems and petioles;

2) in the parenchyma of the petioles, sporadically even as deep as the phloem;

3) in sub-epidermal cells near the margin of the leaf, and

4) in small multicellular hairs on the leaf and on the stipules.

The more or less marked intensity of the red colour depends on the number and distribution of the pigment cells. There are therefore only two real colour types in jute, capable of exact, ready definition, *viz.* red and green.

In 1908 a red variety, Bhadya Red of Jalpaiguri, was crossed with a green one, Desi of Dacca; in 1909 the F_1 hybrids showed simple dominance of red according to Mendel's Law; the red colour was, however, less intense than in the parent plant. In 1910 the seed from artificially selfed flowers of F_1 was sown alongside of seed from naturally fertilized ones. In both cases the plants varied in colour from red to pure green; they were classified into the following types:

(*a*) Red stems, with red petioles and fruits.

(*b*) Light red stems, petioles and fruits.

(*c*) Green stems with reddish petioles and fruits.

(*d*) Pure green.

Of the two alternative characters — presence of red colouration and its absence — the former was dominant; the ratio of those with the pigment to those without was 3.3 : 1 in the artificially selfed plants, and 3.0 : 1 in the naturally fertilized ones.

In the F_3 plants from both these groups, the same colours appeared again. The unfixed descendants of those artificially selfed in F_1, gave reds and greens in the following proportions: progeny of colour (*a*) 2.92 : 1; (*b*) 3.04 : 1; (*c*) 2.99 : 1. The same figures for the other group were: (*a*) 3.03 : 1; (*b*) 3.17 : 1.

The F_3 descendants resulting from natural fertilization of F_2 plants which were pure green gave 1 red to 66 green, or 1.5 % of reds. This is an indication of the amount of cross-fertilization which had taken place.

The facts that (*a*) one result of these experiments has been to produce examples, fixed or unfixed, of all the intermediate colour types of jute hitherto met with, (*b*) it has been shown that a small amount of chance crossing is possible, are reasonable evidence for tracing to chance hybridization the origin of the intermediate coloured races of jute in cultivation.

Self fertilization is, nevertheless, the rule in the species; and, while chance crossing probably does take place to a small extent, it is not likely to exceed 2 % under the most favourable conditions for its occurrence; and it seems probable that normally it is not much above 0.2 %.

It would appear therefore that, in breeding experiments with jute, there is little need for elaborate precaution to prevent cross-pollination; and that no more than ordinary care would be necessary to preserve a superior race of jute from contamination by adjacent inferior crops.

CEREAL AND PULSE CROPS.

1084 GOODWIN, P. W. **Maize and Paddy Cultivation at the Kalimpong Demonstration Farm in Bengal.** — *Department of Agriculture of Bengal: Quarterly Journal*, Vol. V. No. 3, pp. 119-128. Calcutta, 1912.

British India: Bengal

Some interesting figures are given in this Report on the cost of cultivation of maize and rice at the Demonstration Farm of Kalimpong in Bengal at an altitude approaching 4 000 feet.

Maize was grown on 19.7 acres, of which 10 acres were under experimental cultivation. The outturns are here shown:

(The Bengal maund of 40 seers = 82.3 lbs., *i.e.* nearly 3/4 cwt.).

	Area	Weight as carried in with leaves attached		Weight of grain		Grain per acre	
	Acres	Mds.	srs.	Mds.	srs.	Mds.	srs.
Experimental	10.0	545	0	298	12	29	33
Non-experimental . .	9.7	520	16	246	7	25	15
Total . . .	19.7	1 065	16	544	19	27	25

The proportion of grain from the cobs with leaves attached was 51.1 per cent against 47.3 per cent last year. The average of 27 maunds 25 seers shows a very large increase over that of 1909-10, which was 21 maunds 21 seers.

The following tables show the results of experimental maize cultivation in 1909-10 and 1910-11.

(100 Rupees = £ 6 13 *s* 4 *d* or $ 32).

1909-10.

Area	Outturn		Value			Cost of Cultivation			Profit		
	Mds.	srs.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
11 acres . .	280	18	595	12	10	295	15	6	299	13	4
per acre . .	25	10	54	2	9	26	14	6	27	4	3

1910-11.

10 acres . .	298	12	671	2	9	327	5	6	343	13	3
per acre . .	29	33	67	1	9	32	11	9	34	6	0

The value is calculated at Rs. 2-2 per maund of grain in 1909-10 and 2-4 in 1910-11.

The flat varieties have been the heaviest croppers both years (flat yellow aud flat white).

The figures for the manurial experiments of the last two years are :

Manure per acre	Outturn 1910		Outturn 1911	
	Mds.	srs.	Mds.	srs.
1. 100 maunds manure and 2 maunds superphosphate .	28	32	29	0
2. 100 maunds manure	27	17	30	36
3. Unmanured	25	8	27	2

The following table shows the total and average outturns, cost of cultivation, etc., for rice.

Area	Outturn				Value			Cost of Cultivation			Profit	
	Grain		Straw		Grains Rs. 2-8 Straw As. 6							
	Mds.	srs.	Mds.	srs.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.
10.63 acres. . .	185	33	368	4	602	9	6	449	7	6	153	2
per acre. . . .	17	19	34	24	56	10	6	42	4	6	14	6

The average profit is only about two-thirds that of last year, which was Rs. 21-6-7. The grain is calculated at the same value and the straw at 1 anna per maund less. The cost of cultivation in 1909-10 was Rs. 46-1-5 per acre against Rs. 42-4-6 this year.

Compared with the profit on maize the above sum is very small, and maize is undoubtedly the better paying crop.

Tables are given showing the results of the variety experiments and the particular items of cost of cultivation of maize and rice, taken from the farm accounts.

FORAGE CROPS. MEADOWS, AND PASTURES.

1085 PATUREL, G. **On the Composition of Fodder damaged by Rain.** (Sur la composition des fourrages avariés par les pluies). — *Journal d'agriculture pratique*, 76e Année, No. 17, pp. 524-527. Paris, 25 avril 1912.

France

The author begins by quoting the results of experiments conducted at the School of Agriculture of Fontaines on eight cows of various ages, with the object of determining the effects of the quality of the fodder on the milk yield and on the production of calves.

The manner of administering the food was the same throughout the experiments, only its quality varied. The following are the most important figures in this connexion :

Average milk yield per cow	1909	393 gallons
	1910	275 »

Average weight of the calves:

	At birth	At weaning	Increase per day
1909........	98 lb.	215 lb.	2.6 lb.
1910........	88 »	194 »	2.0 »

From the above the author states that the fodder of 1910, which was a rainy year, was far from equalling that of the preceeding year.

The fact of having assisted in these experiments, induced the author to investigate further into the matter. He collected 13.2 lb. of lucerne, the same weight of clover and the same of grass from meadow, all freshly cut. He divided each into three equal parts, of which one was dried in a barn, one placed on the pavement of a courtyard and copiously watered twice a day for 12 days, after which it was dried in a barn. The third sample, so as to imitate the prolonged leaching produced by floods, was soaked for five days in a tub of water and then dried like the other samples. They were then placed in a thermostat until they attained a constant weight, for the determination of the dry matter, after which they were analysed. The following are the results referred to 1000 lbs. of fresh forage:

Contents of 1000 lb. of Fresh Forage variously treated:

		Dry matter		Proteids		Fats		Ash		Phosphoric acid		Lime	
		Total	Percentage of amount in control	Total	% of amount in control	Total	% of amount in control	Total	% of amount in control	Total	% of amount in control	Total	% of amount in control
		lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Lucerne	Control . .	260	100	40.7	100	6.6	100	23.5	100	1.4	100	9.2	100
	Watered .	208	80	29.7	73	4.4	66	15.7	67	0.9	64	5.1	55
	Soaked . .	176	67	23.2	57	3.5	53	8.1	34	0.5	35	3.6	39
Clover	Control . .	282	100	44.4	100	8.8	100	24.6	100	1.4	100	7.9	100
	Watered .	236	83.5	34.2	77	6.1	69	19.6	79	1.1	78	5.6	71
	Soaked . .	216	76.5	34.7	71	4.8	58	12.3	50	0.7	50	3.9	49
Meadow grasses	Control . .	372	100	29.2	100	8.2	100	27.9	100	1.7	100	6.3	100
	Watered .	273	73.1	22.2	76	5.2	63	17.2	61	1.1	64	3.5	55
	Soaked . .	304	81.7	21.2	72	4.6	56	18.2	65	0.8	47	1.8	28

These figures show the great losses that hay suffers from bad weather during haymaking. The losses amount to 25 to 40% for the watered hay and to 50 % and upwards for soaked hay, clover suffering somewhat less than the other forage.

In order to avoid a decrease in the yield of stock fed on such damaged hay the addition of concentrated foods becomes necessary, especially those rich in proteids and ash.

FIBRE CROPS.

1086 GUILLOCHON, M. L. **Cotton in North Africa.** (Le Cotonnier dans l'Afrique du Nord). — *Journal de la Société Nationale d'Horticulture de France*, Tome XIII, pp. 207-212. Paris, avril 1912.

Algeria. Tunis

The result of a very recent government enquiry, shows that in 1910 the area under cotton in Algeria was 533 ha. (1 317 acres), of which 410 (1 013 acres) are in the district of Orleansville; the gross production was 7 000 qls. (1 540 000 lbs.), or an average of 13 qls. per ha. (1 160 lbs. per acre). In 1911, the cultivated area was 779 ha. (1 925 acres).

In Tunis, the cultivators have only turned their attention to the systematic and sustained cultivation of cotton for two years. In 1911, about 60 ha. (148 acres) were sown, divided between about 20 experimenters, who cultivated from ½ to 10 ha. (1 ¼ to 25 acres). In 1912, the area under cotton will be much increased.

The question of cotton-growing in French N. Africa should be considered from two points of view: the purely cultural and the strictly commercial.

Cultivation. — It is know that, in general, and in the coast districts especially, Egyptian varieties thrive better than American, as they resist the high summer temperature better. The Egyptian varieties do best wherever irrigation is not practised, in districts where the crop depends entirely on winter rain. Among the Egyptian varieties the most recommendable are Mitafifi and Janovitch, and among the American, Mississippi. In the Experimental Garden at Tunis, the Sicilian Biancavilla has been grown with success; it has short lint, but yields heavily and is drought resistant.

Under the conditions of French N. Africa, three systems of cultivation should be studied; irrigation cultivation, mixed cultivation and dry cultivation.

Irrigation Cultivation. — This requires ploughing with a reversible plough 12 to 14 in. deep in November; in January spreading of manure, followed by cross-ploughing. In March, 3 cwt. of superphosphate are spread and harrowed in.

Between April 10th and 20th, sowing takes place when the soil is hot, but not after cold spring rain. During growth, the fields are irrigated every 15 to 20 days, the interval between the two irrigations being increased when the lower bolls are formed and begin to open.

Mixed Cultivation only differs from irrigated cultivation in that the irrigation is stopped when all the plants begin to flower.

This method is used for naturally moist soils, on which irrigation would cause too rank a growth, to the detriment of the flowers, and consequently of the fruit.

Dry cultivation of cotton is one of the most remarkable applications of dry-farming; it consists in ploughing and harrowing in October and again in January or February, and several hoeings during the vegetative period. To carry out this system, it is necessary to have a soil which easily retains moisture and is near the coast, so that the plants may be provided with an atmosphere sufficiently moist to prevent excessive transpiration.

Harvest. — The harvest period extends from the end of July or August to November or December. The bolls must not be gathered unlil they are quite open and the lint makes tufts on the exterior; but picking must not be delayed too long, for the wind in summer and the rain in autumn cause the lint to fall, and it is then lost, as it becomes stained with earth. Each picker, male or female (native women and children being often employed), carries a bag made as an apron, provided with two pockets and tied round the waist. In the one are placed the best bolls, in the second, the others. This is the first selection. On reaching the end of the row, the picker empties the load into two different receptacles. These are placed in shelter for some days in a well-ventilated and dry shed. The cotton thus gets quite ripe before being baled.

At the present prices, according to the system of cultivation employed, irrigated, mixed, or dry, 1 hectare of cotton can yield a net profit of 600, 400 and 500 fr. respectively (£ 9 12 *s*, £ 6 8 *s* and £ 8 per acre).

The minimum crop is from 8 to 10 qls. of raw cotton (700 to 900 lbs. per acre), which gives about 250 to 350 kg. (220 to 310 lbs. per acre) of cotton thread for an outlay on cultivation of 350 to 500 fr. per ha. (£ 5 12 *s* to £ 8 per acre).

It may therefore be concluded that cotton-growing should be encouraged in Algeria and Tunis, and could not be a loss to the colonists; for if the price fell, the yearly sowings could be stopped.

CROPS FOR SUGAR PRODUCTION.

1087 **Two Chemico-Physiological Studies on Sugar Beets** (1).

(1) STROHMER, F. (Ref); BRIEM, H. and FALLADA, O. Weitere Untersuchungen über das Abblatten des Zuckerrübe. Mitt. der chem-techn. Versuchsst. des Zentralver. f. die Rübenzuckerind. S. VI, No. 36. — *Oesterreichische-Ungarische Zeitschrift für Zuckerindustrie u. Landwirtschaft*, LXI J., 2. H., pp. 228-240. Wien, 1912.

(2) ANDRLÍK, K. and URBAN, J. Über die Variabilität des Stickstoffgehaltes in Zuckerrübenwurzeln. Berichte der Versuchsst. f. Zuckerind. in Prag, CCXXVI. — *Zeitschrift für Zuckerindustrie in Böhmen*, J. XXXVI., H. 9, pp. 513-519.

Austria

The authors of the first paper have carried out an extensive series of researches on the influence of stripping leaves from sugar beets, thus completing the preceding researches of Achard, Andrlik and Urban.

The numerous analyses made, in the first place confirm that stripping the leaves is injurious to the total crop and to its sugar content. They then show clearly that early stripping injures the whole crop, while late stripping lowers the sugar content.

The effect of removing a single whorl is more than trebled when three are stripped, and a diminution of sugar content is specially noticeable when the second whorl is removed, in which it appears that the condensation of the simplest sugars (monoses) into common sugar (saccharose) chiefly takes place.

Stripping also diminishes the production of dry matter, whilst it increases the ash content and especially the amount of potash.

The authors of the second paper continue their studies on the heredity of chemical characters in beets. They find, in the first place, that in the descendants of one mother-beet the nitrogen content is connected with the sugar content by a complex relationship which is determined by the law of variability governing both these factors, because also for nitrogen content, Quetelet-Galton's law of casual variations holds good.

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(1) Cf. *B*. April 1912, No. 639. (*Ed.*).

That is to say, for a given nitrogen content in individuals of the same descent, an equal sugar content does not correspond, and vice versa. For the same sugar content in individuals of the same descent the nitrogen content varies within the limits of its variability, with the exception of the maxima and minima of nitrogen content. Reciprocally, for a given nitrogen content, the sugar content varies within the limits of its variability. But the variability of nitrogen content is greater than that of sugar content and in the case of the highly bred descent which was investigated it was 75 % and upwards of the average nitrogen content, while the latter was only 17.5 % of the average sugar content.

Practical Conclusions.

I. Stripping beetroots of their leaves is always injurious, both on the total crop (early stripping) and on its sugar content (late stripping).

II. Stripping the second whorl has a specially unfavourable effect on sugar content.

III. The relationship between sugar content and nitrogen content of the beets of a common descent is not casual, but is determined by the law of variability of the sugar content and of the nitrogen content of the descent considered.

MALPEAUX, L. and LEFORT, G. **Experiments at the School of Practical Agriculture at Berthonval, on the Cultivation of Sugar Beets.** (Culture de la Betterave à Sucre. Experiences faites à l'Ecole pratique d'agriculture de Berthonval). — *La Sucrerie Indigène et Coloniale*, No. 20, pp. 463-467 ; No. 21, pp. 484-488. Paris, 14 and 21 mai 1912. 1088

The experiments made at Berthonval in 1910 dealt with the choice of the variety of beets, with singling, with the influence of the development of the leaves and of the intensity of light, and with the sugar content.

On comparing several French and German varieties it was found that the best, beyond discussion, are the Wesche and Heinz-Mette for their yield, and Heinz-Mette for sugar-content.

On the subject of singling it is certain that early and very regular singling, choosing the finest plants, is one of the surest ways of obtaining heavy yields, both in weight and in sugar content.

Early singling is never injurious, whilst doing it late always is so and invariably diminishes the future crop to a great extent.

The following results of the experiments at Berthonval furnish a convincing proof of the above assertions :

Lot singled on:	Roots per acre: tons	Roots per acre: cwt.	Leaves per acre: tons	Leaves per acre: cwt.	Density	Purity
June 7	15	1	9	1	8.5	88.1
June 12 . . .	14	18½	9	11	8.4	88.0
June 19 . . .	13	12	8	19	8.0	86.3

In singling it is important not only to leave the best seedlings, but also to have them at the most regular distance apart possible. In Germany very fine extremely regular beet fields are to be seen, owing to the singling being done twice with great care. In France the process of singling is not so well done, partly because it is often done as piece-work. The importance of accurate singling being more and more recognized has led to the use of mechanical appliances by means of which the work has improved.

With this object the seed is drilled in continuous lines and rather abundantly; if the soil is well prepared, sprouting is regular and speedy, especially if seed with a high germinating power has been used. The field is hoed along diagonal lines so as to leave the beet seedlings arranged in quincunxes. The machine employed must have special blades which raise the soil and turn it over, otherwise the roots would sprout again in wet weather. Women and children then finish the work by hand.

In the comparison made at Berthonval between machine work and hand work the following results were obtained :

	Yield		Average weight		Density	Purity
	tons	cwt.	Roots lb.	Leaves lb.		
Hand singling	33	13	1.76	1.60	7.6	87
Machine singling	35	5	2.00	1.68	7.7	88

In Germany, singling leaves the beets about 8 to 10 inches apart in the rows, which, with the rows at 15 inches from each other, means about 40 000 to 48 000 per acre. Sometimes, but more rarely, only 36 000 an even 32 000 are left.

The number of seedlings to be left depends upon the nature of the soil, the amount of moisture it contains, and to a certain extent upon the variety of beets.

In beets, as in potatoes, the yield and contents in reserve hydrocarbons are connected with the development of the leaves.

At Berthonval in 1909, analysis showed that the plants with the highest content were those in which the ratio between leaves and roots varied between 125 and 75 to 100. Beyond these limits the quality of the beets declined, the degree of purity being lower, so that the fall in sugar content was more marked than that in the density of the juice.

In 1911 the following results were obtained:

Percentage of leaves to roots	Average weight of roots lb.	Density of juice at 15° C	Sugar % of beets	Apparent purity
51	2.1	8.0	16.1	88
55	2.0	7.3	14.9	89
65	2.0	8.3	16.9	89
70	2.4	8.0	16.1	88
71	2.6	7.4	15.5	86
76	2.9	7.6	14.7	85
87	2.4	8.1	16.2	88
108	2 9	7.6	14.7	85
122	2.0	7.9	15.4	86
130	3.1	7.6	15.3	89
150	2.0	7.4	14.4	85
230	1.9	7.1	14.1	87

On comparing large, medium and small beets the following results were obtained:

	Average weight of roots lb.	Percentage of leaves to roots	Density of juice at 15° C	Juice % of beets	Apparent purity
Large beets	3.3	62	7.5	14.7	86
	3.1	100	7.6	15.3	89
Medium-sized beets .	2.0	45	7.3	14.9	86
	2.4	65	8.0	16.1	89
Small beets.	0.9	50	8.3	16.9	89
	1.4	72	8.3	16.5	88

Consequently a small development of leaf corresponds to poor roots. In selecting for seed, due weight must be given to the foliage of the seed beets.

M. Pagnoul had already demonstrated that the quantity of sugar produced by beets depends less upon the sum of heat received during the period of vegetation than upon the light and rainfall.

In this connection the authors have made some experiments, covering the beets, about a month before lifting, with bells made of a special green paper and of grey canvas instead of glass; whilst others were covered with wooden boxes. The following is a resumé of the results:

Analysis of the Leaves.

	Dry matter %	Density of juice	Glucose in juice %	Potassium nitrate % of juice mgr.
November 10, in the open . .	14.55	3.9	1.40	180
» under green paper	12.4	3.7	2.75	180
» under canvas . .	12.9	3.55	2.50	160
» under boxes . . .	13.2	3.5	2.75	170
November 19, in the open . .	15.1	5.1	2.20	180
» under green paper	12.6	5.0	1.80	170
» under canvas . .	12.4	4.5	1.70	160
» under boxes . . .	13.1	4.4	2.35	160

Analysis of the Roots.

	Average		Density of juice at 15° C	Sugar % of juice	Apparent purity	Sugar percentage of beets	Glucose percentage of juice	Potassium nitr. in mgr. % of juice
	weight of roots lbs.	weight of leaves lbs.						
October 15, in the open:								
Control No. 1	2.09	2.04	8.3	18.6	87.5	15.9	—	—
November 10:								
Control in the open . .	1.76	1.54	8.0	18.5	88	15.9	0.40	90
Under green paper . . .	1.54	1.54	7.8	17.6	86	15.1	0.51	148
Under grey canvas . .	1.68	1.76	7.5	17.0	86	14.7	0.32	—
Under a box	1.76	1.32	7.3	16.2	85	14.7	0.54	270
November 19:								
Control No. 1	1.76	1.92	8.0	18.7	89	16.1	0.22	100
Control No. 2	1.76	1.76	8.1	18.8	89	16.2	0.24	108
Under green paper . . .	1.76	1.94	7.8	17.4	85	15.0	0.26	145
Under grey canvas . .	1.65	1.90	7.6	17.4	87	15.2	0.27	—
Under a box	1.41	1.94	7.33	17.0	88	14.7	0.27	225

The above figures show the effect of the intensity of light on the quality of the roots. The leaves in the open also reveal a more active elaboration. The juice of the leaves, which is especially rich in glucose, in order to balance the juice of the roots whose sugar is almost entirely saccharose, has a specific gravity about half that of the juice of the roots.

RUBBER, GUM AND RESIN PLANTS.

De Wildeman, E. **Manuring of Rubber Trees.** (Engrais dans la culture des caoutchoutiers). — *Le Caoutchouc et la Gutta-Percha*, No. 97, pp. 6037-6041. Paris, 15 mars 1912. **1089**

It has been demonstrated that the use of a certain amount of manure is necessary for the successful growing of rubber trees. Some chemical compounds not only exert a favourable action on the development of the trees, but also on the yield of latex. Thus it appears from various experiments, which however are not completely conclusive, that nitrate of soda increases the flow of latex and the proportion of rubber.

At Hawaii some Manihots were manured with nitrate of soda buried to a depth of 4 inches. The experiment was conducted with three lots of Manihot. The first was kept as control, the second was manured with ¼ lb. of the salt per tree and the third ½ lb. per tree. The control trees yielded during the experiment 1 to 2 oz. of dry rubber each; those of the second lot 1 to 3 oz.; and those of the third lot 2 to 3 oz. per tree. The effects of the nitrate begin to show after 48 hours. M. E. Lierke has demonstrated that potash plays a most important part in furthering the development of Heveas, but it must also be borne in mind that manures and especially potash seem to favour the development of plant parasites also.

Among the rubber growers in the East lime as a manure raises at present the greatest interest. The value of lime must be considered according to the soil in which the trees are grown. In the Middle East the soil is peaty, clayey or sandy. In peat soils deep drainage is advisable, after which the soil must be allowed to dry and then it is limed in order to neutralize its acidity. Clay soils improve physically after the addition of lime; they are easier to till and do not crack after prolonged drought. In sandy soils lime improves the cohesion. Lime acts also directly as plant food, it prevents the development of the weeds which infest acid soils, and its application may also become necessary after the repeated use of other manures, such as sulphate of ammonia, kainit, and superphosphates which, in the long run, produce a certain amount of acidity in the soil.

Lime further stops the development of fungi which produce root rot, and especially of *Fomes semitostus* which causes serious injury to Heveas.

It is recommended to slake quicklime with water, allowing it to turn to a dry powder, and then to spread it broadcast at the rate of about 5 cwt. per acre, and at least four times as much on peat or clay.

Experiments conducted in tropical regions where the rainfall is abundant show that it is preferable to apply lime and the other manures during the relatively dry season.

In the Malay States the following formula is recommended:

	Per acre
Slaked lime	½ to 1 ton
Basic slag	350 lb.
Sulphate of ammonia . . .	150 »
Sulphate of potash	100 »
or Kainit	400 »
or Chloride of potash . . .	100 »

Instead of salts of ammonia, castor-oil, linseed, cotton-seed, earthnut or Hevea-seed cake may be given, and guano may be used instead of basic slag.

Most crops grown between the Hevea trees appear to retard their development and diminish the yield of rubber. Tapioca, sugar-cane and pine-apples exhaust the soil considerably; coffee and cacao are not so harmful, especially if the plants are kept at a sufficient distance.

There is a good deal to be said both in favour of and against the use of artificials or of green manures, and the planter must judge according to his special conditions and decide which type of manuring may be most useful, or whether he may not preserve and improve the fertility of the soil by "clean weeding" and sterilise its surface by the heat of the sun. This last method naturally requires a great amount of careful labour which cannot always be given.

VARIOUS CROPS.

1040

AMOS, ARTHUR. **Hop Growing on the Pacific Coast of America.** — *The Journal of the Board of Agriculture*, Vol. XIX, No. 2. pp. 89-98. London, May 1912.

United States. British Columbia

The area and production of hops in the four principal hop-growing States of North America from 1849-1909 are shown by the following table:

Date	New York		Oregon		California		Washington	
	Area	Production	Area	Production	Area	Production	Area	Production
	Acres	Cwt.	Acres	Cwt.	Acres	Cwt.	Acres	Cwt.
1849 . .	4 000	22 000	0	0	0	0	0	0
1859 . .	15 000	86 000	0	0	0	0	0	0
1869 . .	30 000	157 000	—	87	—	5 500	—	55
1879 . .	39 000	193 000	300	2 000	1 100	13 000	500	6 000
1889 . .	36 700	179 000	3 100	32 000	4 000	58 000	5100	74 000
1899 . .	27 500	155 000	15 400	131 000	6 900	90 000	5300	61 000
1909 . .	12 000	77 000	21 000	139 000	8 400	107 000	2400	36 000

The last census shows that the Pacific States now easily hold the first position, both Oregon and California producing more hops than does New York State. The reason of this transference of the hop-growing area is found in the rich soil on the Pacific Coast, combined with an exceptional climate; the average crop on the Pacific Coast varies from 8 to 15 cwt. per acre, whereas the average crop of New York State varies from 5 to 8 cwt.

In 1904, the Oregon hop-growers made very large profits, for a "pool" was formed in England, as a result of which 147 000 cwt. of hops were shipped to the latter country. The consequence was, that in 1903, 1904 and 1905 fully 10 000 acres of hops were planted in Oregon alone. In 1906, owing tothe favourable season and this increase, a very large crop was produced; and the effects of the low prices were so seriously felt that an agitation was started for an increase of the tariff on imported hops, which was successful.

On the Pacific Coast, the hop-yards are collected in well-defined areas situated in the river valleys. In California, there are two main hop-growing districts, those of Sacramento and Sonoma, which together contain about 10 000 acres. In Oregon, there are about

20 000 acres lying for the most part in the valley of the Willamette River.

This district may be divided into the "valley" yards, near the river, where the best crops are obtained; and the "prairie" yards, on the higher levels, where the yield is less, owing to the smaller amount of moisture. In Washington, one district is on the coast and has Portland as its centre, while the other is situated along the valley of the Yakima. In British Columbia, hop-growing is confined to a very small area, about 800 acres, in the valley of the Fraser river.

As the cost of manual labour is high, every effort is made in the matter of organisation and the use of labour-saving machinery to reduce the need for this to a minimum. For example, every garden is arranged so that horse cultivation can be carried out in both directions; and every kiln is supplied with some device for elevating the green hops to the drying floor.

1041 **Tobacco-Growing in Honduras.** (Der Tabakbau in Honduras). — *Revista Economica*, Año II, Núm. 6, pp. 593-596. San José, Costa Rica, Enero 1912.

Honduras

Tobacco ranks among crops with a great future in Honduras. At first tobacco-growing was confined to the Department of Copan, near Guatemala, which supplies nearly three-fourths of the production of Honduras. In 1901 more than 10 million young plants were put into the ground, yielding a crop of 13 582 quintals. In 1909 the output was 15 000 quintals. In view, however, of the not very rational system of growing, the article was not fit for export. In order to develop and improve tobacco-growing an experimental station was founded at Dauli which has proved that with Honduras tobacco, provided it is properly cultivated, a good deal may be done, and it may be made to rival and even surpass Cuban tobaccos; for while the latter are grown on soil manured with guano, in Honduras the cultivation takes place on virgin soils which do not impart defective burning qualities to the tobacco. The Honduras market, furthermore, is not ruined by the speculations of syndicates.

The land adapted for tobacco is extensive, but capital is wanting to develop the cultivation and industry on a large scale and a rational footing. Land for tobacco-growing can be purchased in Honduras at a low price; the Government grants State land at an exceedingly small annual rent. Tobacco in Honduras is cultivated a great deal along the banks of rivers. The varieties of Copan tobacco grown on dark soils rich in humus are darker and stronger, but have a good flavour and aroma.

Some of the Dauli tobaccos are greatly appreciated for use as cigar wrappers owing to their extraordinary flexibility, their fine light colour, and the delicate veinings on the tender outside leaves. The cigars made in the special school are in no respect inferior to the « Vuelta Abajo » cigars of Cuba, and are consumed within the country, in the neighbouring republics and likewise abroad.

SCHROTTKY, Baron. **Indigo in Ceylon and India.** — *The Tropical Agriculturist,* No. 4, pp. 299-305. Colombo, April 1912. **1042**

British India: Ceylon

The natural indigo industry, at one time one of the most prosperous industries in the East, has been practically ruined by the competition of synthetic indigo discovered by Bayer. The Badische Company was able to sell its product at a profit at the cost price of natural indigo. This competition naturally resulted in the closing of most Indian indigo factories. The export of indigo, which in 1896 was 187 337 cwt., had fallen in 1910 to 18 061 cwt. Indigo continued to be grown in Behar and elsewhere in India, but chiefly for the sake of the manure it yields.

But it has been demonstrated that a revival of the industry was possible, if planters would put their factories on a sounder financial basis, practise economy in the management of their estates, select the best yielding variety of the indigo plant and adopt more scientific methods of manufacture. A great advance was made by the introduction into India of a new variety of plant, *Indigofera arrecta*, a native of Natal, which not only yields a larger crop per acre than the old variety, but is also hardier, withstands prolonged drought better, and does not need to be resown every year. It will crop for at least three years and even five years. *Indigofera arrecta* yields also as much as 50 % more dye than the old variety.

Indigo dye exists in the leaves and in the green parts of the plants in an insoluble form and the whole of it cannot be extracted by the simple process of maceration and fermentation hitherto generally adopted, and by which 100 lb. of green plants yielded about 1/4 lb. of dry dye, whilst by the improved methods of scientific manufacture they can be made to yield as much as 3/4 lb.

Besides, formerly natural indigo was put on the market in a dry form, and the dyers consider it absolutely essential that it be prepared in the form of paste; this has now been successfully accomplished by the new methods of manufacture, thus further assisting natural indigo to compete with the synthetic product.

In Ceylon both the climate and the soil are favourable to the cultivation of indigo, which grows better in the Island than in Behar. It grows wild in the low country, and at high altitudes it is found up to 5000 feet; it grows in the dry and in the wet districts and there are some sixteen varieties of *Indigofera* indigenous to the Island. The plant grows in Ceylon for the greater part of the year and will yield three or four cuttings in the year calculated at about 32 000 lb. In the dry districts only two cuttings can be expected, which would yield about 20 000 lb. per acre. The out-turn of dye for Ceylon may be safely estimated at about the same as that obtained in Behar by scientific methods of manufacture, *i. e.* 2 ½ lb. of standard indigo paste per 100 lb. of green plant, though actual manufacture has shown that the yield of dye is higher in Ceylon than in Behar. *Indigofera arrecta* and *I. sumatrana* have been experimentally cultivated in Ceylon and the plants have grown satisfactorily.

Besides the production of dye the indigo yields as a by-product one of the most valuable of manures, and for this reason also its cultivation is strongly to be recommended for Ceylon.

1048 Chalot, C. **World's Production and Consumption of Vanilla.** (Production et Consommation de la Vanille dans les differents pays). — *L'Agriculture Pratique des Pays chauds*, No. 107, pp. 334-337. Avril 1912.

The amount of vanilla produced in the French colonies and in the other vanilla-producing countries during the last few years was as follows:

French colonies —	1909 lb.	1910 lb.
Tahiti . . .	456 043	565 963
Réunion . .	182 245	143 167
Madagascar .	95 389	94 366
Mayotte and Dependencies	91 524	106 317
Guadeloupe .	34 427	20 038
	(39 259 in 1911)	
Martinique .	4 599	2 560
Gaboon . .	450	694
	(1 113 in 1911)	
Guiana . . .	55	18
New Caledonia	a few score lb.	

Besides that from the French Colonies the following amounts of vanilla were produced in other countries :

		lb.
Mexico	in 1909	312 019
	» 1910	333 739
Seychelles . .	» 1909	24 912
	» 1910	50 809
Mauritius . .	» 1909	7 321
	» 1910	1 878
Java	» 1908	2 425
	» 1909	7 716
Ceylon	» 1909	3 569
	» 1910	661

The consumption of vanilla is very regular. In order to calculate exactly its amount, the stocks remaining at the end of each year in the various centres ought to be known, and this is no easy task. Nevertheless, averages may be obtained by adding up the importations of a certain number of years for each country; these averages will allow an idea to be formed of the increase of consumption during determined periods. Thus the following data are obtained:

	1909	1910
United States	1 120 444	796 359
Germany	234 569	—
France	125 501	134 730
England	110 000	110 000
Russia	33 000-44 000	33 000-44 000
Italy	24 875	—
Belgium	23 214	—
Holland	12 125	—
Switzerland	13 200	13 200
Denmark	—	5 600
Sweden	2 163	—
Norway	1 988	—

The production of vanilla and the trade in this commodity have a special interest for France as her colonies grow two thirds of the amount produced in the whole world.

The above figures allow the course of production and consumption of vanilla to be followed, and this may lead producers not to extend excessively their cultures, in order to avoid the fall in prices which would necessarily follow too great a production.

MARKET, GARDENING.

1044 BULTEL, M. G. **On Forcing Plants, especially Strawberries, by Means of Ether Vapour.** (Sur le Forçage des Végétaux et notamment sur celui du Fraisier soumis aux vapeurs d'Ether). — *Journal de la Société Nationale d'Horticulture de France*; Tome XIII, pp. 212-217. Paris, avril 1912 (1).

France

The results of experiments made by the writer show that the application of ether both increases the quantity and improves the quality of the yield. These can be compared with the effects of dipping in warm water which are also much to be recommended. The writer began in 1906 (*Journal de la Société*, page 29) experiments in etherizing strawberries for forcing. This experiment was followed year by year by partial experiments, which resulted in the plants treated with ether being always superior, outstripping the controls which were treated in the usual manner.

In 1911-1912, as is seen by the accompanying table, the experiment was made with 600 strawberry plants of the variety Vicomtesse Héricart de Thury, divided into two series of 300 plants, of which the one was treated with ether, and the other not.

The second series was divided into two lots, each of 150 plants; the first lot was only shut up for 48 hours and received the total dose of ether at 65° Baumé and weighing 120 gr. immediately after the closing of the etherizing chamber; the second lot, as it was to be subjected to treatment with ether for 60 hours, had first only helf the normal dose, the rest being given 48 hours afterwards.

For each lot the proportion of the dose was 400 gr. per cubic metre (4 oz. per 10 cub. ft.) of air. In spite of the differences in the treatment, the results obtained were practically the same, with, however, a little advantage on the side of the lot which had been subjected for the longer time to the effects of the ether. This length of time appears to be the best, especially for very early forced crops. The strawberry plants experimented on had all been cultivated and treated alike.

Treating strawberry plants with ether has proved very efficacious, especially in hastening flowering in the case of the larger number of individuals.

The production of earlier fruit by this method can, in future, be practised in commercial cultivation.

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(1) See also, *ibid.* janvier 1910, p. 64.

Experiments on Ether Treatment of Strawberries (Vicomtesse Héricart de Thury) 1911-1912.

Treatment	No. of plants	Date of treatment	Date of putting in hot-bed	Number of plants brought in to house (showing first flowers) on dates :				Total put in house	Rejected owing to poor flowering	Remainder grown on	Plants not flowered	Total rejected	Date of beginning of ripening	Date of ending of ripening
				8.I	16.I	23.I	30.I							
No ether	300	—	25.XI	33	79	83	29	224	26	198	76	102	6.III	(Not ended 28.III)
Ether 48 hrs. . .	150	25.XI	27.XI	106	7	—	—	113	17	96	37	54	21.II	15.III
Ether 60 hrs. . .	150	28.XI	1.XII	107	10	3	5	125	9	116	25	34	21.II	17.III
Total treated with ether	300			213	17	3	5	238	26	212	62	88		

FRUIT-GROWING.

1045 SNELL, K. **Observations on the Action of the Stock on Selected Scions.** (Beobachtungen über die Beeinflussung des Edelreises durch die Unterlage). — *Fühling's Landwirtschaftliche Zeitung*, 61. Jahrgang, 6. Heft, pp. 206-209. Stuttgart, 15. März 1912.

Investigations were undertaken with the object of determining the mutual influence exerted by the scion and the stock on the time of breaking of the buds.

Germany The graftings were carried out in the spring of 1910 by transferring early varieties of apples to late and early varieties and *vice versa*.

The scions were Landsberger Reinette (early) and Bellefleur (late) and the stocks Wintergoldparmäne (early), Kassenkopf (late) and Bellefleur (very late). Parent plants were cultivated separately for control purposes. The results obtained from the observations in the following year are perfectly clear and characteristic, as seen from the following conditions of development of the budding phase.

The graftings of Bellefleur on Wintergold are earlier than the same graftings on Kassenkopf; and the latter earlier than the parent plant Bellefleur. Even the most vigorous graftings on Kassenkopf where behindhand as compared with those on Wintergoldparmäne.

For Landsberger Reinette it is found that the parent plants are earlier than the graftings on Wintergold, and the latter earlier than the same graftings on Kassenkopf. Finally the latter is more precocious than the graftings on Bellefleur.

The fact emerges that the stock exercises a direct action on the moment of breaking of the buds. The investigations, though few in number and lasting over a short space of time, nevertheless allow of recording the existence of a mutual action in the sense that early scions affect the bud formation of late stocks and conversely early stocks hasten the appearance of the buds on late scions. From the practical point of view it follows that it is not indispensable for the stock and the scion to be perfectly contemporaneous in the development of the buds.

COUANON, G. **Table Grapes in the South of France and in Algeria.** (Les Raisins de table dans le Midi et en Algérie). — *La Vie Agricole et Rurale*, No. 27, pp. 5-6. Paris, 1er juin 1912. **1046**

France. Algeria

The cultivation on a large scale of table grapes for export has only been practised for about thirty years in S. and S. W. France and in Algeria.

Generally speaking, the planting of vineyards for growing table grapes, which now exist in the neighbourhood of Agen, around Moissac, Montauban, Toulouse and further south, in Vaucluse, Hérault, Gard, and Pyrénées Orientales, dates from the reconstruction due to the attacks of phylloxera; and it is only since the organization of the rapid steam-boat service, that the first plantations of early grapes have been made in the neighbourhood of Algiers.

The Chasselas Doré, said to be of Fontainebleau, is almost the only grape grown in France for table fruit. Thousands of acres of this vine have already been planted and are treated in the same manner as vines for wine. There are 3 670 ha. (9 065 acres) in Tarn-et-Garonne, 2 000 (5 000 acres) in Lot-et-Garonne, 2 000 in Vaucluse, 3 000 (7 500 acres) in Hérault, 1 500 in Gard and 1 100 (2 700 acres) in Algeria, only to mention the districts of large production.

The fruit arrives on the market in the following order: July, early Algerian Chasselas; August, Chasselas from the south, followed by the south-west; September, Chasselas from the Paris district.

The price of Chasselas, with the exception of the grapes from the neighbourhood of Paris, averages about 25 fr. per quintal (10s. per cwt.). Thus a crop of 50 to 60 qls. per ha. (40 to 48 cwt. per acre) gives a gross return of 1 250 to 1 500 fr. (£20 to £24 per acre), which, after the deduction of 800 fr. (£13 per acre) at the most for cultivation expenses, and not counting the interest on the capital, gives a net profit of 450 to 700 fr. per ha. (£7 to £11 per acre). But the price taken is an average one.

Owing to the risks attending the cultivation of Chasselas, some vine-growers have tried lately to grow late grapes. In this, their aim is twofold: to obtain grapes ripening late in the season, from October to the end of November, which will make their appearance on the market when a low price is no longer to be feared, and also take possession in the most efficacious manner of foreign markets, and especially of the English one.

The following are the names of varieties of late grapes which the writer mentions as being capable of advantageous cultivation in the South-West region, the Rhone valley below Lyons, in the South, and in Algeria.

WHITE GRAPES.

Dattier de Beyrouth (synonyms: Rosaki, Doigt de Déesse) — Vigorous, productive; bunches large and shouldered; grapes very large, olive-shaped, golden yellow; period III; vine tall.

Valensi (synonyms: Téñéron de Vaucluse, Olivette de Cadenet, Malvoisie de Chartreux; Valencin Réal; Faphly). — Very vigorous, average bearer; bunches large, cylindro-conical, branched, loose; grapes large, ovoid, amber-white; period III; vine tall.

Alexandrian Muscat (synonyms: Panse Musquée de Province, Raisin de Malaga, Muscattellone du Piémont, Salamanna bianca). — Growth average; productive; bunches large, or very large, cylindro-conical, long, branched, loose; grapes large or very large, olive-shaped, of a dull green, which changes to greenish-yellow; flesh firm, crisp, juicy and sweet, much prized for muscat flavour; period IV; vine tall.

Raisin de Notre-Dame (synonym: Panse jaune). — Very vigorous; productive; bunches large, branched, shouldered; grapes very large, ellipsoid, amber-white when quite ripe; period III; vine tall. Magnificent grape, but with flesh of a poor quality.

Saint-Jeannet (synonyms: Vigne de Michel, Raisin d'Anatolie). — Very vigorous; productive; bunches large, branched; grapes large or very large, olive-shaped, greenish, with bloom; period IV; vine tall. Much grown in the Alpes-Maritimes and consumed during the visitors' season on the Côte d'Azur.

BLACK GRAPES.

Dodrelàbi (synonym: Gros Colman). — Very vigorous; heavy bearer; bunches large, shouldered, cylindro-conical, close; grapes very large, spherical, black with bloom, shaded with red; period III; vine short. One of the finest varieties.

Lady Dowe's Seedling. — Fairly vigorous; productive, bunches above the average or large, cylindrical, long, loose; grapes large, round, slightly depressed; black with bloom, with slight muscat flavour when ripe; period IV; vine short.

Murelle. — Vigorous; irregular bearer; bunches large, truncated conical; grapes large, ellipsoid, black, slightly glossy; period IV; vine tall.

Muscat, Pince's Black. — Very vigorous; heavy bearer; bunches above the average, or large, cylindro-conical, loose; grapes large ellipsoid, reddish black, with bloom; period IV; vine tall.

From time immemorial the Kabyles have cultivated a number of late vines, namely: Ferrana, Ahmeur bou Ahmeur, Oued' Zitoun, Cherchali, etc. Their grapes ripen in November and December and can be left hanging a very long time.

Vineyards in the Grand Duchy of Luxemburg. (Le Vignoble du Grand-Duché de Luxembourg). — *L'Informateur,* 5e Année, No. 42, pp. 207-208. Paris, mai 1912. **1047**

Luxemburg

According to the land register the area under vines in the grand Duchy of Luxemburg is 3 821 acres. The country is situated at the northern limit of the vine: it has therefore been necessary to select with care those varieties capable of yielding rather early grapes. The chief varieties cultivated are:

1. Kleinberg or Elbing, imported by the Romans, and capable of yielding 900 to 1 070 gals. per acre.
2. Red Kleinberg or Folchert, also a very heavy bearer, but producing a not very alcoholic and somewhat acid wine.
3. Riesling (delicate, aromatic) producing a very fine wine with a rich bouquet, but it has the drawback of ripening late; by crossing with muscatels the Rheinriesling has been obtained; it is a heavy bearer but unfortunately ripens late.
4. Sylvaner, called also Autrichien, gros Rhin, grande Avoine; it ripens regularly and produces a sweet wine, but as this is not very stable, it is blended with Riesling or Kleinberg must.
5. Rulander, which belongs to the family of Pinots and is known in France under the names of Pinot gris, Auxerrois and Burot. It thrives in heavy soils. The grapes ripen well; the wine is of good quality, rich, sweet and savoury.
6. Bourguignon blanc (Pinot blanc, Morillon blanc) a heavy bearer; the grapes mature well and yield a sweet and pleasant wine.
7. Heunisch (Hinsch); gives a sour wine, without flavour or aroma and is not grown to any extent.

For the last 25 years no stocks for red wine have been planted, and those that are met with are:

1. Bourguignon noir (Pinot noir, Auvernot noir, Noirien) yields a good wine, but it is not very productive.

2. Gamay noir (Large Gamay de Liverdun) is a stock that bears heavily and is not particular as to soil.

3. Meunier blanche-feuille prospers in low valleys and produces agreeable wines.

4. Saint-Laurent, which is cultivated in Alsace, grows rapidly, producing fine early grapes and a wine with an agreeable bouquet.

According to the figures given by the Vineyard Commission, the communal administrations, and the wine growers' syndicate, the crops from 1904 to 1911 were as follows in (gallons):

1904	3 143 600
1905	714 984
1906	614 300
1907	1 103 327
1908	3 458 563
1909	662 192
1910	709 459
1911	3 001 570

The average prices per gallon were:

	s	d		s	d
1904	1	1	to	1	5
1905	1	1			
1906	1	10	to	2	1
1907	2	0	»	2	1
1908	1	4	»	1	6
1909	1	6	»	1	9½
1910	2	8½	»	3	5
1911	2	3	»	2	5

1048 KLEIN, OTTO. **The Olive and its Products in Portugal.** (Der Oelbaum und seine Produkte in Portugal). — *Journal für Landwirtschaft*, 60. Band, Heft 1, pp. 31-58. Berlin, 1912.

Portugal

The olive is cultivated in Portugal on the arid mountain slopes, and when it is grown on level ground, it is associated with other crops. The olive grows up to an altitude of 400 m. (1 500 ft.) in North Portugal, and to 900 m. (nearly 3 000 ft.) in Algarve. Fifteen varieties are cultivated, but they have have not all the same extension. The most widely grown kinds are Verdeal in the northern provinces and Gallega in the South. The fruits are both large and small; the former (" Sevilhana ") are used for the table and for preserving, the latter for oil-making, and include the Verdeal and Gallega varieties.

Propagation is rarely effected by means of seed, though this method produces healthier roots, and more productive and lasting trees. The system adopted for reproduction is either grafting upon wild olives or taking cuttings.

The olives are either hand-picked or brought to the ground by beating and shaking the trees and branches. The harvest in the South and on the mountain slopes begins in October and ends in April.

The Agricultural Experiment Station at Porto Alegre has made various experiments to determine the value of the crop according to the season, and the best way of preserving the fruit.

The experiments gave the fallowing results for the Gallega variety at progressive stages of ripeness:

	Air-dried						Dried at 105° C.		
Date of gathering	Pulp		Pomace		Whole Fruit		Pulp Oil %	Pomace Oil %	Whole Fruit Oil %
	Moisture %	Oil %	Moisture %	Oil %	Moisture %	Oil %			
Oct. 10	7.96	22.28	7.28	36.29	15.24	58.57	24.21	39.15	63.36
Nov. 10	9.20	28.40	7.18	33.77	16.38	62.17	31.70	36.24	67.94
Dec. 10	8.72	31.36	8.17	33.26	16.89	64.62	34.35	36.21	70.56
Jan. 10	7.88	31.84	6.86	33.29	14.74	65.13	34.56	35.75	70.31
Feb. 10	8.20	29.60	7.53	32.56	15.73	62.16	31.89	35.21	67.10

It was further ascertained by means of these experiments that in order to preserve the olives up to the time of their transport to the oil factories it was necessary to protect them from contact with the air and avoid, by every possible antiseptic means, the decomposition of the albuminoid substance. This is shown by the following experiment.

The olives were placed in large wooden barrels and packed tightly, but not in such a manner as to be damaged. To some of the barrels 5 % of common salt was added. The top was covered with sacks and the whole hermetically sealed with a layer of clay about 4 in. thick. The olives to which no salt had been added kept fresh for only three or four months; the others were in perfect condition at the end of eight months.

The oil industry has made great progress in Portugal of late years, and is now organized on a scientific and hygienic basis. Nevertheless, the old Roman methods of oil-making are still practised in the provinces. The modern machinery is imported from France and Italy.

Numerous experiments are being made at the present time in the extraction of oil from the olive stones. From 45 kg. of crushed stones, 1 283 gr. of kernels were obtained, which yielded 96 gr. of oil under cold pressure, and 5.9 gr. more under hot pressure. The first product was straw-coloured, with a pleasant odour and taste; the second was greenish, differing from the first but little in smell and taste. For its chemical composition the pomace oil differs little from pure olive oil and its acid content is in any case not greater.

The following table gives an idea of the quality of the different Portuguese oils in the various districts:

District of Production	Variety of Olive	Specific gravity	Refractive index at 25° C.	Free acids %	Iodine value
Mirandella.	Verdeal	0.9165	1.4670	0.83	78.77
Coïmbra. .	Gallega	0.9164	1.4670	2.11	78.76
Vizen . . .	Cordovil	0.9169	1.4682	0.34	83.32
Elvas . . .	Carrasquenho tinto.	0.9168	1.4674	0.45	82.98
» . .	Carrasquenho bravo	0.9163	1.4678	0.25	82.25
» . . .	Glosinha	0.9168	1.4679	0.76	83.50
» . . .	Rodondil	0.9164	1.4674	0.75	81.34

The olive residues form an important food on Portuguese farms for, together with acorns, they are used for pigs. Their value is less from the industrial point of view. There is, however, one factory for making a second extraction from the residues and preparing oil-cakes.

The results of experiments made in Portugal show that the olive residues are poor in mineral substances and in nitrogen. Their nutritive value depends solely upon the fatty matters, and their manurial value is doubtful.

The waste water from the pressing carries away with it many useful substances.

In Portugal, as elsewhere, olive oil suffers from competition with other oils made from fats and mineral oils. Nevertheless, the oil industry and trade are in a flourishing condition. Brazil and the Portuguese colonies are the best customers, though England buys a certain amount.

The following are the number of gallons exported from Portugal in periods of five years beginning from 1871:

Period	Gallons
1871-75	4 998 950
1876-80	1 821 930
1881-85	1 142 640
1886-90	1 052 820
1891-95	1 354 240
1896-900	2 845 000
1901-05	3 250 025
1906-10	3 221 440

MOORE, J. C. **The Lime Industry in St. Lucia.** — *West Indian Bulletin*, Vol. XII, No. 1, pp. 44-49. Barbados, 1912. **1049**

West Indies: St. Lucia

The first attempt to plant limes on a commercial scale in St. Lucia was made in the year 1901.

Since then and up to 1911 the total number of lime plants distributed from the nurseries of the Agricultural Department to landowners was 257 907. From 1901 to 1905 there was only one estate on which limes were grown. In 1905 there were 4; in 1906, 11; 1907, 19; 1908, 24; 1909, 30; 1910, 42. On some of them the limes occupy only a few acres, while on others the acreage ranges from 30 to 70. It is estimated that the total area under limes at the beginning of 1911 approximated to 800 acres. The trees range in age from one to nine years.

Although the industry is still in its infancy, there are indications that in the near future it will rank high in importance in the agriculture of the Colony.

The plantations are on land situated at altitudes ranging from sea level to about 1 000 feet. The soil also varies considerably in character, from sands to heavy loams. The greater number of the plantations are on alluvial soil.

Observations made during the past four years on the progress of trees in various parts of the island and under varying conditions of soil and treatment have shown that the question of drainage is one of the most important points in cultivating limes, especially on clayey soils.

The fact that limes will grow in certain soils and situations unsuited for cacao, of which there is a considerable quantity in St. Lucia, has been recognized, but there is a danger of this adaptability being overrated.

The lime is attacked by the following scale insects: the orange mussel scale (*Lepidosaphes beckii* [*Mytilaspis citricola*]), orange snow scale (*Chionaspis citri*), West Indian red scale (*Selenaspidus* [*Aspi-*

diotus] *articulatus*) and the green scale (*Coccus viridis* [*Lecanium viride*]). The fungi that have been observed to be parasitic on these scales are: the red-headed fungus (*Sphaerostilbe coccophila*), the black-headed fungus (*Myriangium Duriaei*), and the shield-scale fungus (*Cephalosporium Lecanii*).

The green limes were mostly shipped from the windward coast, but the difficulty of securing prompt sloop connexion between the windward coast and the steamers arriving at Port Castries appears to have checked the development of exports, but it is probable that the trade will make further progress when the plantations on the leeward coast — which is served by a daily coasting steamer — are more advanced.

The first small shipment of concentrated juice was made in 1907. It is calculated that about 60 acres of limes might supply a modern factory fitted with steam concentrating plant. The advantages secured by the concentration of juice by steam instead of by direct firing are the following: the loss of acid is reduced to a minimum, and a purer juice is obtained and at a higher degree of concentration; the heating and boiling are under better control, and lastly a greater heating value per unit of fuel used is secured.

1050 SIEVERS, ARTHUR F. and TRUE, RODNEY H. **Preliminary Study of the Forced Curing of Lemons as practised in California..** — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 232, pp. 1-38. Washington, 1912.

United States

The process called " curing " in California, covers primarily the changing of the deep green colour of the rind to the rich waxy lemon-yellow. It is a very important feature of the lemon industry, for the properly cured lemon has a better appearance, better keeping quality and a thinner rind.

Lemon curing must be conducted under the greatest possible uniformity of temperature and of humidity. It is carried out mainly in tents in the packing house. These tents consist of rectangular rooms usually of sufficient size to hold about 600 packing cases of loose fruit; the sides and tops of these rooms are of canvas and so arranged as to allow air to circulate among the boxes or to shut it out almost entirely. The ventilation of the first requires very thorough study in order to determine just the right amount necessary to obtain the best results. Green fruit cured under this arrangement requires from 30 to 60 days to reach a marketable condition.

The forced curing process differs from ordinary curing. It consists in producing the change from green to lemon-yellow in a very short time, supposedly by the use of high temperatures and a high percentage of humidity. The market at times requires the crops to be in condition for sale within a week or two after leaving the orchard.

The analyses made of different types of lemons gave the following averages according to the various methods of curing followed:

Method and state of maturity	Thickness of rind	Weight of fruit	Juice of lemons				Acid in lemons	
			Volume	Specific gravity	Yield	Yield of acid	Weight	Yield
							gr.	%
Dark green.	5.9 to 6.6	127.63	39.2	1.039	34.7	6.17	2.63	2.09
Cured . . .	5 to 5.9	117.6	46.3	1.040	41.3	6.80	3.22	2.75
Forced cured (sweated).	4.8 to 5.4	119.6	47.6	1.037	41.9	6.36	3.14	2.64
Tree ripes .	4.4 to 5.3	116.9	45.1	1.036	40.9	5.98	2.73	2.38

Several methods of sweating lemons are now in use, but their difference lies only in mechanical and technical features. The arrangements of the sweat room are such as to allow a temperature of 90 to 95° F. and a relative humidity ranging from 90 to 100 %. Where sweat houses differ is in the method of supplying these conditions.

The forced curing or sweating of lemons as at present practised, is produced in from 5 to 14 days.

The experiments described by the authors show that heat and humidity are of minor importance in colouring lemons, and that the pungent gaseous combustion products given off by the oil stoves used produce the desired effect. These gaseous products can be conducted to distant rooms by means of pipes, their effectiveness being thereby unimpaired. They might be generated in separate structures, thus greatly reducing the risk of fires.

The colouring of lemons is noticeably hastened when confined in spaces constructed of materials of a porous nature.

It is recognized that further work is required in order to apply the results already obtained to the practical use of the lemon producer.

Banana-growing in Costa Rica. (Bananenkultur in Costa Rica. La Industria Bananera en Costa Rica). — *Revista Economica,* Año II, Num. 6, pp. 596-599 y 628-630. San José, Costa Rica, Enero 1912. **1061**

Costa Rica

The bananas produced in the vast plantations of the "United Fruit Co." are loaded on board ship by a mechanical apparatus of recent invention. The steamers carry in bulk from 18 500 to 55 000 bunches.

The total area under bananas in Costa Rica is nearly 100 000 acres, of which almost a third belongs to the above-mentioned company which now uses ploughs on about 8 400 acres of bananas, whilst 20 000 acres are kept free from weeds by hand implements. Nearly 3 000 acres more will shortly be planted.

The cost of cultivation is about £12 per acre, that of harvesting and preparing the crop for the market about £5,8*s.* and where the plough is used £7,4*s.* The machine which has hitherto given the best results is the " Cut-away disk cultivator " drawn by oxen or mules.

The total production of bananas in the months of October and November was 600 000 bunches and as many were calculated for December; during the rest of the year the monthly crop ranges between 700 000 and 1 200 000 bunches.

A great increase has been, and is being, given to banana growing by the United Fruit Co., which is also conducting experiments with deep ploughing by means of steam ploughs.

Very damp and soft soils are not suited to bananas. For the improvement of exhausted soils planting in rows, steam ploughing, drainage, the use of lime and artificials are recommended. One of the greatest difficulties that banana growing has to contend with is the destruction of weeds. This work is best done by machines, working frequently and thus preserving the fertility of the soil.

A new company, the « Atlantic Fruit Co. » has bought lands which, in full bearing, will produce 3 000 000 bunches per annum.

FORESTRY.

1062 HAACK. **Tests of Conifer Seeds.** (Die Prüfung des Kiefernsamens). — *Zeitschrift für Forst- und Jagdwesen*, 44, Jahrgang, Nr. 4., pp. 193-222; Nr. 5, pp. 273-307. Berlin, Mai 1912.

Germany

In this work there are set out the results of many observations and experiments in the testing of pine seeds, conducted by the Author in the mycological laboratory of the Forestry School of Eberswald.

The following are the conclusions:

1. Testing with uniform results is possible in any period of the year, provided that in each case the same conditions of environment affecting the germinating capacity (moisture, light and temperature) are maintained.

2. The filter-paper in the germinators should have an area of about 50 sq. cm. (7 $^3/_4$ sq. in.) to every 100 seeds; with plenty of space there is no danger of healthy seeds being infected by diseased ones and the paper does not need changing very often.

3. At low temperatures germination begins later and develops more slowly than at high temperatures. The total germination capacity however is finally the same in both cases. As high temperature combined with a high degree of moisture may lead to the decomposition of the seeds, the optimum degree of temperature varies according as rapidly or slowly germinating seeds are in question, and according as the tests are carried out in the light or in the dark. The experiments must be conducted under optimum or nearly optimum conditions of temperature. Under these conditions temperature fluctuations beneath the bell have much less influence than at low temperatures on the rapidity of germination, which is used to determine the germination energy.

In practice the optimum temperature may be fixed at 25° C. (77° F.) for spruce and Scots pine. At a constant temperature there is a fixed relation between the temperature (heat) of germination in the sense that the product of the duration of germination multiplied by the number of active degrees of temperature (above 5° C. or 41° F.) is always the same, whether the process takes place at high or at low temperatures. By exposing seeds of Scots pine intermittently to high temperatures the germinating process is accelerated. This action is similar to that exerted by light, but is not enough to allow of counterbalancing an exessive deficiency of light by changes of temperature.

4. The results of tests carried out in full light are sometimes modified by the intensity and duration of exposure to sunlight. The action of this factor is however exceedingly limited, and on cloudy days the short spells of sunlight do not prove effective in producing a stimulating action.

The germination of Scots pine seeds is positively affected by all the rays of the spectrum: most energetically by the red rays and least by the violet. On spruce seeds only red and yellow have an effective action; violet is injurious. For artificial illumination in testing experiments therefore the use of petroleum or electric lamps with red glasses is recommended. Continuous illumination is not necessary; 8 to 10 hours per day suffice.

The seeds of Scots pine likewise react to deficiency of light; the best effects in practice however are obtained under a light convenient to read by. Brightness beyond this is needless. Provided that the minimum illumination is supplied there are no substantial differences between natural and artificial light.

In carrying out tests in full daylight the material should never be exposed direct to the sun, but localities in the shade and with northerly aspect be selected.

5. The course of germination of batches of seed under identical conditions of environment is represented by a curve the posterior part of which is exactly determined by the anterior portion. The development of this curve may therefore be graphically represented with accuracy provided that its initial course is carefully studied over a sufficient length of time.

The germination curve gives us a very clear idea of the quality of the seed and allows of a comparison of the rates of germination even with data obtained under non-uniform conditions of temperature.

The rate of germination is not so accurately expressed by the percentage for seeds germinating in the first ten days (from sowing) as it is by determining the interval of time required with a given temperature for the germination of one half of the germinable seeds. Thus for instance $84\ \% \left(\frac{25^{\circ}}{5.8}\right)$ means that having a lot of seeds with 84 % degree of germination capacity, there is required, to induce the germination of one half (42), a period of 5.8 days with a temperature of 25°. In the majority of cases 12 days of observation at 25° suffice. The final result is indicated graphically with sufficient clearness simply by prolonging the curve which is obtained after a period of 12 days' observation.

6. The quantity of germination energy may, by using a sufficient number of seeds, be reliably determined even in simple germinators.

In commerce, where the price depends precisely on the germinating percentage, the method known as " sale on analysis " is to be recommended as the best mode of supply.

Feilitzen, H. v. **Influence of the Drainage of Peat Soils on Woody Growth.** (Ett nytt exempel pa torrläggningens unverkan pa skogsväxten pa torfjord.). — *Svenska Mosskulturföreningens Tidskrift*, XXVI Ar, No. 2, pp. 104-110 + fgs. 24-29. Jönköping, 1912. **1053**

Sweden

In the experimental field of Torestorp, the Swedish Peat Moor Reclamation Society in Jönköping, after the felling of a certain number of trees, found that the annual rings were wider from the year 1884 onwards; now it was precisely in 1883 that the peat moor on which the trees were growing had been drained.

		Radial growth in mm.					
		Before drainage			After drainage		
Species	Age	Period	Growth		Period	Growth	
			total	annual		total	annual
Spruce. . . .	65	1846-83	36	0.95	1884-1910	96	3.56
» . . .	61	1850-83	102	3.00	1884-1910	165	6.11
Scots Pine. .	71	1840-83	44	1.00	1884-1910	59	2.19
Birch	51	1860-83	40	1.67	1884-1910	164	6.07
Alder	65	1846-83	54	1.74	1884-1910	46	1.70

It is clearly evident from this that draining was the cause of the increased annual growth, except as regards the alder, which appears to be able to stand great humidity of the soil without detriment.

Electric Compared to Steam Logging.—*Forestry Quarterly*, Vol. X, No. 1, pp. 100-102. Cambridge (Boston), Mass., 1912. **1054**

United States

The following is a tabulated statement of the cost of an outfit for logging by electricity compared to that of a steam method where the skidding is done by donkey engines:

Power Plant:

	$
Intake and dam	50
Pipe line, 18 inch wood stave (continuous), laid	640
Water wheel, installed (200 HP. capacity)	300
Power house, shed construction	150
Electric generator and station instruments	950
Wiring (1/2 mile)	400
Total cost, ready to operate . . .	2490

Electric donkey, complete, with 50 HP. motor geared 8 to 1, with same drums and equal to 9×10 inch steam outfit and guaranteed to do the same class of work	950
Electric falling and bucking saw, takes one man to run it; will do the work of 5 men	150
Complete equipment up to roader point in logging operation	3 590
To this amount should be added for 65 HP. « roader » donkey	1 150
Extra line construction for same	250
Making the total outlay for a complete electric outfit to skid logs, 3000 ft.	4 990

To operate this outfit will require the following fixed costs, to get an output of 80 000 feet of logs per day:

	$
Interest on investment, at 10 % to cover contingent extras, $490 per year, or per day of 300 working days in year	1,66
Depreciation, 5 %	0,84
1 Electrician at power house	4,00
2 Electricians at donkeys ($4 each)	8,00
2 Chokermen ($3 each)	6,00
1 Sniper	3,00
1 Chaser	2,50
3 Rigging slingers ($3,50 each)	10,50
1 Signal man	3,00
1 Faller and bucker to operate electric saw	3,50
	43,00
To this add another $2 for repairs especially chargeable to the electric equipment	2,00
And we have as the total day cost of operating	45,00

Or a cost of 51 cents per thousand from tree to the water, on 3 000 foot delivery.

Opposed to this is the average cost of logging by steam:

	$
4 Fallers at $3	12,00
3 Buckers at $3	9,00
Yarder crew: 1 driver, 1 fireman, 1 bucker, 1 chaser, 1 hooktender, 2 rigging slingers, 1 swamper and sniper	26,00
Roader crew: 1 engineer, 1 fireman, 1 bucker, 1 chaser, 1 grabman	16,00
Yarder upkeep (½ estimate)	5,00
Roader upkeep (½ estimate)	8,25
Total daily cost, 3000 foot haul for 50 000 to 75 000 feet B. M.	76,25

In conclusion, the cost of logging per one thousand feet of logs would be:

	$
Electric . . .	0,51
Steam . . .	1,00-1,50

J. M. **Forest Exploitation in Abyssinia.** (Waldexploitation in Afrika).—*Oesterreichische Forst- und Jagd-Zeitung*, 30. J., No. 20, p. 177. Wien, 17. Mai 1912. **1055**

Abyssinia. Egypt

In the north and north-east of Abyssinia, there are wooded zones of some millions of acres. Of special importance is a district of about 25 000 square miles, which is watered by the Atbara, a large river which joins the Nile 250 miles below Khartum and 35 miles above Berber.

Owing to the scarcity of wood in Egypt, and the constantly increasing importation, about £1 200 000, the English are considering the question of the utilisation of the above-mentioned forests, having recourse for transport to the Atbara, which affords a waterway of 500 miles, though with some obstacles, which, however, are not regarded by the English engineers as insuperable. They think of introducing for this purpose the Canadian system, making the river floatable and forming rafts, which will be brought down to the chief depôt at Berber, motor-tugs being used where necessary. Already this year, Canadian experts will be making experiments. It is calculated that Abyssinian wood will thus be brought down to Lower Egypt free from all competition.

In case this plan should fail, the forest reserves of the Albert Nyanza will be made use of. The timber would be brought down by the Blue Nile; but the distance in this case would be increased by at least 300 miles. Further, there are more natural obstacles to be overcome, unless these difficulties should be resolved by the completion of the projected Cape to Cairo railway.

LIVE-STOCK AND BREEDING

HYGIENE.

1056 SCHARR, E. **The Control of Tuberculosis in Cattle according to the New Regulations in Germany.** (Die Bekämpfung der Rindertuberkulose nach dem neuen Reichsviehseuchengesetz).—*Berliner Tierärztliche Wochenschrift*, XXVIII. Jahrg., No. 20, pp. 349-353. Berlin, 16. Mai 1912.

Germany

According to the new Regulations respecting cattle diseases, which came into force on May 1, 1912, measures will be taken in Germany against tuberculosis in cattle in the same manner as other contagious cattle diseases.

I. Control of cattle tuberculosis is enforced by the State throughout the whole German Empire. The object is to hinder the spread of the disease by rendering harmless animals with affected lungs, udders, uterus or intestines. Every cattle-owner and cattleman is obliged to notify the local police, if one of his cattle show signs of tuberculosis. The suspected animal is then subjected to clinical inspection by the veterinary, who takes samples of mucus from the lungs and vagina, of milk and of faeces, which he forwards to the Institute of Bacteriological Inspection indicated by the Government. If there it is proved, after two examinations (by microscope and by inoculation of guinea-pigs kept for experiment), that tubercle bacilli are present, the animal in question is marked by branding on the left thigh, or is ear-marked. It has to be kept apart from healthy animals. Should it be a case of tuberculosis of the udder, the cow can be killed on the order of the President of the District Government Board, and with the permission of the Minister; the owner being paid an indemnity of four fifths of the market value of the animal. The State pays one third of the indemnity, and the Province the remaining two thirds.

II. The cattle breeder can, of his own free will, undertake the combating of the disease, under the superintendence of the State and with State assistance. Also in this case, the regulations under clause I are obligatory; in addition, the whole stock (all cattle over six months old) are examined in the above-mentioned manner, at least once a year, and the calves are so reared that the danger of infection may be reduced. Infected animals, whether the disease is located in lungs, uterus, udder or intestines, are killed by order of the President of the Government Board, and the owner receives as compensation four fifths of the market value of the cattle. A permission from the Minister is, in this case, not necessary for the slaughtering of the animals. Where a cow is merely suspected of having tuberculosis, it is marked and separated from the others which are healthy.

NEVEN-LEMAIRE, M. **Congenital Strongylous Bronchitis in Sheep.** (Strongylose bronchique congénitale du Mouton). — *Comptes Rendus des Séances de l'Académie des Sciences,* Tome 154, No. 20, pp. 1311-1312. Paris, 13 mai 1912. **1057**

France

Hitherto it was not known how sheep became infected with lungworm (*Dictyocaulus filaria*). There were two hypotheses; according to one the larva entered the pharynx of the sheep and passed thence into the windpipe and bronchi where it became adult. According to the second hypothesis, the larva entered the organism either by the mouth or by the skin and found its way into the blood stream which carried it to the lungs, whence it reached the bronchi and the windpipe.

An observation made by the Author confirms the second hypothesis.

He found adult *D. filaria* in the windpipe of a lamb which had died 4 days after birth, as well as in the windpipe of a foetus taken from a young ewe which had died of cachexy and whose respiratory organs were also infected with the parasite.

This would afford proof that congenital infection is possible, and this can only be explained by admitting that the larvae are borne by the blood stream of the mother to the placenta, whence they pass into the circulation of the foetus, and so to the lungs and windpipe where they become adult.

1058 **France**

RAYMOND and CHRETIEN. **Tuberculosis in Poultry** (1). (Au sujet de la tuberculose des Volailles). — *L'Hygiène de la Viande et du Lait*, 6e Année, No. 4, pp. 211-226. Paris, 10 avril 1912.

Fowls suffering from tuberculosis are thin; the muscles, particularly the pectoral ones, are emaciated and the breast bone is very prominent. The legs appear very long, the skin becomes excessively mobile, on account of the disappearance of fatty tissue, and so transparent that the muscles are seen, and appear of a very pale pink colour.

When these symptoms are observed, the disease is definitely determined by means of a careful examination of the lymphatic ganglia of the cervical series of the abdominal viscera, and of the points of the limbs.

The writers, veterinary surgeons at the Central Markets in Paris, give a detailed description of the forms of fowl tuberculosis and the practical examination methods. Having diagnosed tuberculosis fairly frequently, in the poultry offered for sale at the Central Markets of Paris, they made inquiries as to source of supply of these birds, and found that the poultry from one foreign country especially was infected, there being 28 % of diseased birds, in contrast with 10 % in the case of the French poultry.

The following are the data given respecting the rearing of these poultry. The young chickens are fed for the first fortnight on *fresh milk* mixed with crumbled wheat bread, rice and crushed buckwheat; later, the milk is replaced by water and the buckwheat is given whole. After a month the food consists of wheat and " griette. "

The pullets are raised for laying, which generally begins when they are 6 months old, and they are not kept beyond the third year, which is the best age for laying.

They are fed on different kinds of grain and on ground meat; during the moulting season, they are only given barley flour and *butter-milk*. It is interesting to note, that during two periods of the life of these fowls, the by-products of the dairy form a part of their daily rations, which allows of the suspicion that the prevalence of poultry tuberculosis in the country from which these fowls come, may be due to this special system of feeding.

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(1) See *B*. April 1912, No. 695.

FEEDS AND FEEDING.

GILCHRIST, DOUGLAS A. **Feeding Experiments with Cattle and Sheep, 1910-1911.** *Northumberland County Agricultural Station, Cockle Park; Bulletin* No. 17. Newcastle-upon-Tyne, 1912. **1069**

England

I. With the object of comparing the feeding values of decorticated cotton cake and soy-bean cake, a feeding experiment was carried out with 18 head of cattle just over six months old (Shorthorn-Galloway crosses) from January to April 1911. The animals were put into boxes, but were also turned out to pasture for a time during the day. They were divided into two lots of 9 head each. The feeding ration of each group and the results of the experiment are shown in the following table: Daily ration per 500 lb. live weight for both lots: 28 lb. swedes, 6 lb. meadow hay (with some grazing) and:

	Lot I. — 1 3/4 lb. dec. cotton cake			Lot II. — 1 3/4 lb. soy cake		
	cwt.	qrs.	lb.	cwt.	qrs.	lb.
Average F. L. W. (1) of beasts at beginning of experiment	4	1	13	4	1	16
Total gain in F. L. W. per beast in 14 weeks		3	4		2	13
	£	s.	d.	£	s.	d.
Average value of each beast at beginning of experiment	6	0	1	6	0	10
Average increase in value per beast	2	7	4	2	2	0
Cost of food for 14 weeks' experiment	2	0	8	1	17	8
Difference — (gain)		6	8		4	4

(1) F. L. W., Fasted live weight.

The increase of those young cattle fed with decorticated cotton cake was greater than that of those fed with soy cake, but the economic result is not so much different, owing to the smaller cost of the soy cake.

The rations for these cattle were of a maintenance and not of a fattening character and large gains were not to be expected. At the end of the experiment when these animals were turned out to pasture they had no check in their growth.

II. In another experiment, with sheep, the object was:

a) to compare the feeding value of a ration containing swedes to one containing no swedes, but with maize and oat straw as a substitute, containing the same feeding ingredients as the swedes;

b) to ascertain if the digestible amides in a ration are equal in feeding value to the digestible albuminoids.

The experiment extended over a preliminary period of two weeks and the experimental period of eight weeks, during the winter 1910-11. There were 48 sheep which had been grazing during the previous summer. They were divided into three lots of sixteen each. The ration fed and the results were as follows:

Daily ration per sheep	Lot I. 10 lb. swedes, $^1/_2$ lb. meadow hay, $^1/_2$ lb. soy cake. lb.	Lot II. 14 oz. maize meal, 1 lb. oat straw, $1^1/_2$ lb. meadow hay, $^1/_2$ lb. soy cake lb.	Lot III. 14 oz. maize meal, 1 lb. oat straw, $1^1/_2$ lb. meadow hay 7 oz. soy cake lb.
Average F. L. W. (1) at beginning of experiment	117	116	118
Gain in F. L. W. per sheep during eight weeks experiment	$8^1/_2$	$8^3/_4$	$8^3/_4$
	s. d.	*s. d.*	*s. d.*
Average value of each sheep at beginning of experiment	35 5	35 3	36 0
Average increase in value of each sheep	7 11	8 4	8 0
Cost of food for eight weeks experiment	6 0	7 0	6 9
Difference — gain, less other expenses	1 11	1 4	1 3

(1) F. L. W. = Fasted live weight.

Though the ration fed to Lot I gave the least gain in live weight, yet financially it gave the best result, due to the greater cost of the foods substituted for the swedes.

The sheep of Lot I received the same amount of digestible true albuminoids as did those of Lot III; the food of Lot II did not contain more digestible total albuminoids than that of Lot I, but the ration contained more digestible true albuminoids and less digestible amides.

The albuminoid contents of the daily rations, and the average increase in live weight, all calculated for 1000 lb. live weight, were as follows:

	Digestible true albuminoids lb.	Digestible total albuminoids lb.	Average increase in live weight lb.
Lot I	2.29	2.70	1.21
» II	2.49	2.69	1.39
» III	2.33	2.50	1.24

From these figures it is seen that the average daily increases in live weight are very closely in proportion to the amounts of digestible true albuminoids fed, and this indicates that the amount of digestible true albuminoids in the ration is the best guide to the value of the ration, especially when, as in the case of swedes, a large proportion of the nitrogenous matter is in the form of amides.

HANSSON, NILS. **The Feeding Value of Sesame Cake and of Crushed Peas and Vetches.** (Der Futterwert der Sesamkuchen, des Erbsen und Wickenschrots). — *Fühlings Landwirtschaftliche Zeitung*, 61. Jahrgang, Heft 8, pp. 265-274. Stuttgart, 15. April 1912. **1060**

Sweden

The Swedish Central Station for Agricultural Experiments at Stockholm carried out in the winter of 1910-1911, on three estates, feeding experiments on milch cows, with the object of ascertaining the value of sesame cake and crushed peas and vetches as feeds for these animals.

The experiment comprised four lots of milch-cows on estate I, three lots on estate II, and two lots on estate III; all the lots were of six cows. During a preliminary period all the animals were fed alike. As a sample of the rations, the following is a table of the food given on estate I per cow per day:

Earthnut cake	3.3 lb.	Rapecake	0.9 lb.
Molasses	1.5 »	Bran	1.9 »
Mangels	33 »	Turnips	44 »
Hay	8.8 »	Straw	8.8 »

The actual time of the experiment was 41 days on estates I and II. On estate III, two experiments were made in succession, but their length is not clearly given. The food during the principal period was for one lot (the control lot) the same as during the preliminary period. The rations of the other lots were changed in such a manner that the whole of the earthnut cake (3.3 lbs.) was replaced by the same weight of sesame cake, or part of the earthnut cake and part of the bran was replaced in the ration by an equal amount by weight of crushed peas or vetches.

The experiments were undertaken to test the effect of the foodstuffs upon the live weight of the cows, their milk yield and the fat-content of the milk.

The effect of the different rations upon the weight could not be determined. The daily milk yield was increased 1.51 lb. per cow by the use of sesame cake in place of earthnut cake, while sesame cake at the same time decreased the percentage of fat.

The absolute fat production of the cows remained about equal, for the larger amount of milk made up for the lower percentage of fat in the latter. Thus sesame and earthnut cakes are to be regarded as of about equal value as feeds, from the point of view of the production of butter-fat.

The experiments with the crushed peas and vetches were only preliminary experiments, which are to be repeated later. They proved that, given in the same quantities by weight as earthnut cake and wheat bran, crushed peas and vetches do not produce an equal amount of milk. The percentage of fat is, however, higher, so that also in this case the absolute yield of fat was hardly altered.

1061 HANSEN, Prof. Dr. **Feeding Experiments with "Brotmehl"** (Fütterungsversuche mit Brotmehl). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, XXVII. Jahrgang, Stück 18 and 19, pp. 254-257 and 272-276. Berlin, 4. and 11. Mai 1912.

Germany

In Charlottenburg, by order of the police, the leavings from the table must be collected separately from the other waste products of the household. These leavings are collected by the "Allgemeine Müllverwertungs Gesellschaft" of Charlottenburg throughout the whole town; they are then freed from all foreign substances useless as food, which are often found amongst them through the carelessness of many households. The refuse is then ground wet, pressed and dried and subsequently thoroughly mixed; by these processes, a food meal is prepared from the household waste, which is sold under the name of "Brotmehl". It is fed unmixed or with the addition of molasses; it is light brown in colour and has an aromatic smell.

At the request of the German Agricultural Society, the writer has analysed this meal. Three samples of "Brotmehl" were taken and yield the following results (in percentages):

	Dry matter	Crude protein	Digestible protein	Crude fat	N-free extract	Crude fibre	Ash
Without molasses I .	92.83	13.81	12.25	8.52	46.17	4.75	19.58
Without molasses II.	93.91	13.25	11.06	8.66	48.72	3.60	19.68
With molasses , . .	89,36	12.81	9.94	6.97	48.38	3.85	17.35

"Brotmehl" is thus similar to wheat bran in crude nutritive substances. The high ash content is certainly a defect; it is partly due to the presence of many bones in the waste; but apparently it not infrequently happens that ashes get thrown among the table leavings.

The practical use of the product was tested by feeding milch cows on it.

I. — To see how the meal was taken, it was given during a 19 days' experiment to 18 cows, first in the small amount of 2 lbs. per 1000 lbs. live-weight per day; this amount was increased by 2 lbs. every two to four days, till it reached 10 lbs. It was fed mixed with hay, beet slices, earthnut meal and wheat bran. On the first day the cows refused the new food; on the second day, they ate it unwillingly; but from the third day they took large amounts of it readily when given. Only two cows were slightly and temporarily indisposed during the experiment. Their indisposition did not occur at the same time and can scarcely be regarded as the result of their being fed on "Brotmehl".

II. — The principal experiment, which was made on 18 cows, began April 16, 1911 and lasted 107 days. It was divided into 5 periods.

The cows' rations are shown by the following table:

Rations per day and per 1000 lbs. live-weight.

Period	Meadow hay (1)	Beet-slices	Earthnut meal	Bran	"Brotmehl" without molasses	"Brotmehl" with molasses
	lbs	lbs	lbs	lbs	lbs	lbs
16-IV — 8-V 1911	10	9.0	3.0	6.0	—	—
9-V —29-V »	10	6.3	3.5	2.1	—	4
30-V —19-VI »	10	4.5	3.1	2.3	—	6
20-VI —10-VII »	10	4.1	3.2	2.0	6	—
11-VII—31-VII »	10	9.0	3.0	6.0	—	—

(1) 7 cows got through only 9 lbs. of hay daily per 1000 lbs. live-weight.

The "Brotmehl" was always readily taken.

The cows could drink when thirsty from troughs with lids.

Of the 18 cows, 8 suffered from different kinds of disturbances affecting their milk yield and these animals could not therefore be included in the final results. Their indisposition was not due to the "Brotmehl", only in one case did symptoms of apparent colic show themselves, which perhaps might have been caused by this food. As, however, the indisposition was of short duration, and had no bad results, the writer lays little stress upon its occurrence.

The milk yield when "Brotmehl" + molasses was given, was only slightly greater than in the case of a larger ration of wheat bran being used.

The average milk yield (calculated from the total amount) of 10 cows was 37 ½ lbs. per cow per day. The "Brotmehl" increased the fat content of the milk of all the cows, which amounted in the middle of periods II, III and IV to 3.31 % as contrasted with 3.04 % in periods I and V. The favourable effect of "Brotmehl" upon the fat content is perhaps due to the spices derived from the worked-up food waste, and possibly to its aromatic smell (like toast). The solids-not-fat of the milk showed only very slight variations.

A calculation of the feed cost, based upon the market prices at the commencement of the experiments, shows a saving of 1 ½ *d* to *2d* per day and per 1000 lbs. live-weight. "Brotmehl", which is sold at 5*s* to 5*s* 6*d* per cwt., is therefore a cheap food stuff.

III. — In order to determine whether "Brotmehl" in small quantities can be given to breeding cows, 30 cows were given 2 ¼ lbs. daily for 3 months. From the second day, the cows ate it all up to the last crumb. They appeared to feel no ill effects.

The results of the experiments show that "Brotmehl" is a cow feed which deserves notice. It is, however, desirable that the molasses addition should be omitted, as it makes adulteration easy. Further, the name of the compound should be altered from "Brotmehl" (bread meal), as ground bread is a very small ingredient; "Abfallmehl" (refuse meal) would be a more correct designation.

From the point of view of social household economy, the turning to account of the waste from town kitchens is greatly to be desired. In Germany about 9 millions of persons live in towns with more than 200 000 inhabitants; in such towns the founding of establishments for utilizing waste food would be a great advantage, and it would be possible also to work in the refuse from smaller neighbouring towns.

By this means, following in the steps of the Charlottenburg Society, about 100 000 tons, worth £500 000, of useful material could be saved every year in Germany.

1062 BARRE, DE LA. **Feeding Experiments with Lucerne Hay from Argentina.** (Fütterungsversuch mit argentinischem Luzerneheu). — *Mitteilungen der Versuchsstationen für landwirtschaftliche Fütterungsversuche in Karstädt,* 5. Jahrgang, No. 5, pp. 33-37. Karstädt, 26. Mai 1912.

The Argentine lucerne hay was supplied by a Hamburg firm, chopped and in sacks, and its value as a feed was tried upon four milch cows.

Not counting the preparation time, the experiment lasted for three periods covering 45 days in all.

The feeding was arranged in such a manner that two cows received 22 lbs. of Argentine lucerne hay and the other two 22 lbs. German unchopped hay (red clover and meadow hay) per head per day.

The concentrated food of all the cows was the same and consisted, at first, of 4 ½ lbs. of wheat bran and 4 ½ lbs. of coconut-cake per head per day. Later only 2 ¼ lbs. was given.

The bulky food was given so that during the first and third periods the first pair had Argentine lucerne hay and the second pair German hay, and in the second period the arrangement was reversed.

The cows readily ate both kinds of hay. Their condition during the experiment was good. The milk yield gradually fell off somewhat, but this was accounted for by the advanced lactation period.

On the whole, the Argentine lucerne hay proved itself to be equal in value to the German product.

OLIVA, A. **The Utilisation of Cheese Factory By-products in the Feeding of Pigs.** (L'utilizzazione dei sotto-prodotti del caseificio nell'allevamento dei maiali). — *Il Caseificio Moderno*, Anno V, No. 11. Piacenza, 1° giugno 1912. **1068**

Italy

The author considers the typical average sized cheese factory of Emilia or Lombardy capable of dealing with about 33000 gallons of milk per year and utilizing the by-products in the feeding of 50 pigs of the initial weight of 154 to 176 lb. each, and final weight of about 374 to 396 lb. The consumption of food and increase of weight are as follows:

	Food consumed		Increase	
	Whey gals	Maize cwt	Total cwt	Per head lb.
3rd stage, 160 days	14080	256	79	176
4th » 60 »	3960	157	20	44
	18040	413	99	220

The amount of dry matter consumed was:

In the whey	121	cwt
» » maize	376	»
Total	497	cwt

That is to say that 5 cwt. of dry matter are necessary to obtain 1 cwt. of live weight. These figures agree with those obtained in England and in Switzerland and show that pigs are great transformers of food.

The average profits of this industry cannot be stated with much precision as it is subjet to a complexity of circumstances of varying effect, chief among which are the fluctuations in the prices of forage, of pork and of dairy produce. Nevertheless, adopting the above figures, the profit may be approximately calculated as follows:

Expenses.

	£	s	d
Purchase of 50 store pigs at £3 3*s* 6*d*	158	15	0
Maize consumed, 413 cwt at 7*s* 8*d*. .	158	6	6
Total . . .	£317	1	6

Returns

	£	s	d
Sale of 50 pigs (171 ¼ cwt at £2 8*s* 4 ½*d* per cwt.)	414	4	2 ½
Profit . . .	£97	2	8 ½

Therefore for every 100 gallons of milk worked in the factory the profit would be about 5*s* 9*d*.

This figure however is very variable. In general it may be assumed, as is commonly believed, that the profit on the pigs covers the expenses of working the milk, though these have lately increased.

Recently, at Reggio Emilia, it has been justly suggested that the profits on the pigs should not be included in the profits of the milk, the former being an industrial profit by itself due to the personal ability of the pig fattener.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

1064 KUBAT. **Alps reserved for Bulls in the Tyrol.** (Tiroler Stieralpen). — *Wiener Landwirtschaftliche Zeitung*, 62. Jahrgang, No. 36, pp. 438-439. Wien, 4. Mai 1912.

Austria: Tyrol

When bulls are allowed to graze on the alps in company with cows, difficulties arise. Many heifers calve at too early an age, and on the other hand, the physical development of the young bulls is hindered by premature sexual activity. The Agricultural Council of the Tyrol began in the summer of 1910 to purchase and lease alpine pastures for the bulls belonging to the cattle-breeding associations. In the summer of 1911 there were four alps set apart for bulls, two of which were leased, and two bought. In the autumn of 1911, two more alps were bought and the Agricultural Council intends to further increase the number. The alps intended for bulls are to be improved in every way so as to serve as models. Stones and weeds are to be removed, the sheds, herdsmen's huts and manure pits are to be rebuilt, the meadows fenced in, portions set apart to be mown for hay, manuring and the use of artificial fertilizers to be resorted to. The superintendence of this work will be entrusted by the Agricultural Council to a farmer of position in each district.

The bulls are to be weighed on being driven up to the alps and on their return. Experience has proved that the pasture alone does not provide sufficient food for the development of the animals. This also greatly depends on whether, in addition to the grass, the cattle are given any grain (crushed oats or wheat-bran and hay). Where no shelter is provided for the cattle, they often suffer much on the high alps, about 2 000 m. (6 500 ft.) above sea-level, from the inclemency of the weather, and the increase in live-weight is therefore less.

It has been found that young and old bulls get on very well together on the same pasture, provided they are all driven up on the same day. All those which arrive later are set upon by the others and disturbances arise lasting for many days. If, by chance, one bull in the pasture proves to be vicious, it is removed.

The grazing period is during the months of June, July and August (sometimes also September). The price of grazing varies according to the kind of pasture and the age of the animal from 25 to 55 kr. (21*s* to 46*s*) per head. The increase of live-weight in animals grazing for 105 days on the Oberwalchen alp was 1 ½ lb. per head per day; but the absolute increase for bulls there varied from 26 ½ to 368 lbs.

Good herdsmen are necessary to success and are difficult to get. A herdsman receives daily 3 to 4 kr. (2*s* 6*d* to 3*s* 4*d*), and out of this has to find his own food; he is, however, supplied gratis with goats' milk. As of course cows cannot be kept on the bull-alps the Agricultural Council sends up some goats to supply the herdsmen with milk.

HORSES.

1065 NATHUSIUS, SIMON VON. **The Measurements of 1460 Stud Horses and of 590 Troopers' Horses.** (Messungen an 1460 Zuchtpferden und 590 Soldatenpferden).—*Arbeiten der Deutschen Landwirtschaftsgesellschaft*, Heft 205, pp. 1-247. Berlin, 1911.

Germany

The writer gives the measurements which he has taken of the different breeds of horses at shows, of light horses, light stallions of the Trakehnen stud, troopers' horses, riding horses and draught horses. First the height of the withers was taken with the measuring stick, and then the other measurements were obtained. The height of the withers is given in centimeters, all the other measurements are expressed in percentages of the withers' height. In order to attain complete accuracy, many horses were measured twice. In the work mentioned, all the separate measurements were given; thus from those of a large number of horses an average measurement was arrived at for a definite division according to age and

Withers-height in centimeters.

(1 cm.=0.3937 in.; 10 cm.=almost 1 hand).

Breed	Sex	Age 5 years and over		Age 4 years		Age 3 years		Age 2 years		Age 1 year	
		number	height	number	height	number	height	number	height	number	height
Eng. Thoroughbred . . .	f.	11	156.5	—	—	—	—	—	—	—	—
Trotter	f.	25	158.5	—	—	—	—	—	—	—	—
Hanoverian	f.	27	164.7	15	163.3	24	162.1	14	159.1	7	152.1
Holstein Marsh	f.	45	164.9	16	163.7	25	162.5	9	157.5	—	—
Original Belgian	f.	17	162.3	11	161.7	12	159.3	7	156.9	—	—
Rhenish Belgian	f.	20	162.8	11	160.6	23	161.8	34	158.2	20	150.1
Other German-Belgians . .	f.	14	158.9	9	163.4	21	161.4	18	158	17	150.3
Original Belgian	m.	12	163.6	—	—	23	162.6	13	161.4	—	—
Rhenish Belgian	m.	—	—	—	—	11	163.6	30	161.1	—	—

breed. The writer attaches the chief importance to average measurements, provided a sufficient number are taken.

The English thoroughbreds and the trotters have the smallest withers-measurement. In military horses, the geldings regularly measure somewhat more than the mares, the difference being 0.1 to 3.1 cm. The annexed table gives some important figures.

Young horses and draught horses have usually a higher rump than withers measurement.

Length of limb and depth of chest are in correlation. Young horses have longer legs and less depth of chest than older animals; this relation alters with increasing age, owing to the chest becoming deeper. Heavy draught horses have the greatest depth of chest; in comparison with them, light horses are long legged.

The chest girth is least in light horses and English thoroughbreds; it is a little greater in German light breeds, but greatest in heavy draught horses, especially Belgians.

There is just the same relation between width of chest and width of rump.

The cannon-bone was on an average 19 cm. in circumference in 11 English thoroughbred mares which were measured, and 20.6 cm. in 23 English thoroughbred stallions. The German light horses had somewhat thicker cannon-bones (up to 21.7 cm.), and the average in the case of draught horses was found to be from 22.3 to 25.3 cm.

Previous publications of measurements made by the writer have met with some criticism, and the writer takes this occasion of justifying them.

Finally, the body length was determined. In young horses this is small in comparison with the withers height. Light breeds do not attain to the same body length as heavy horses.

Lastly, the writer gives the weight also of the measured horses and recommends both measurements and weight being entered in the stud-books.

FAWCUS, HENRY E. **The Horse-breeding Industry in Yorkshire.**— *The Journal of the Royal Agricultural Society of England*, Vol. the Seventy-Second, pp. 85-116. London, 1911. **1066**

Great Britain: Yorkshire

At what period of history Yorkshire first became famous for its horses is difficult to determine with any degree of accuracy. It is certain, however, that over 200 years ago it was known as the first horse-breeding county of England and has maintained its position ever since. It is true that horse-breeding in Yorkshire, as in practically every other county, has suffered some decline of recent years due to the advent of the motor-car and other forms of mechanical motive power in our streets. There is, according to the official returns of the Board of Agriculture, a reduction of nearly 17 % in the county as compared with the returns of twelve years ago. Nevertheless, Yorkshire breeds upwards of 12 000 foals in a season, which is a large proportion of the 87 000 odd foals which are annually bred in England (excluding Wales).

Every recognized English breed is represented in the county. The breeding of hunters in Yorkshire has always been an important feature, and though it may not be as prosperous as it was thirty-five years ago, the industry probably is in a more flourishing condition there than in any other part of the country. Despite the increasing hold the Shire breed has gained in the county, which has brought with it the conversion of the originally almost, or wholly, light-legged stock of farm-horses into a much heavier, hairy-heeled, cart-horse type, there are still a good many mares that will throw a foal of hunter type to a thorough-bred sire—such as mares with the old Cleveland blood, or with a coach horse cross in them.

Another leading type from which the farmers often breed horses of likely hunter shape are nag mares, which are, in most cases, of nondescript breed and of a variety of cross-bred types. The mares used for hunter-breeding by farmers are in the majority of cases common, but a corrective for this is supplied by the thorough-bred sire, provided he is sufficiently impressive. Yorkshire is unquestionably better supplied with thorough-bred stallions standing or travelling in the district than most other counties, and this necessarily favours the production of hunter stock. The thorough-bred is, practically speaking, the only kind of sire which plays any part in the hunter-breeding industry; formerly however « hunter bred » or half-bred stallions were used.

Yorkshire is very closely associated with the early history of the thorough-breds raised for racing purposes, for the *Darley Arabian* stood in Yorkshire. There are two noted thorough-bred studs in Yorkshire: the Sledmere and the Langton Hall studs.

Hackney breeding began in Yorkshire more than a hundred years ago. The Yorkshire Hackney strains were originally built up with Norfolk trotter blood on a foundation provided by the native breed of nags and roadsters. The Hackney breeding industry in this county entered upon its most prosperous epoch towards the eighties of last century. In 1884 was founded the Hackney Horse Society together with the establishment of the stud book and the institution of the London Hackney Show. New studs were formed, which resulted in a greatly increased demand for stallions and mares, and prices went up accordingly. The export of Hackneys to America, which began in the eighties, also contributed to the success of the industry. Italy and other Continental countries began to buy Hackneys, and soon after a considerable trade developed with the Argentine, while recently there has been a demand for the breed in Chile and Japan. During the last seven years, Hackney breeding has been falling off in Yorkshire, as compared with the state of the industry some twenty years ago, when it was at its zenith. The cause of this decline is the much reduced demand for ordinary Hackneys. Animals of the best class fetch good prices, but the prices for Hackneys used for everyday harness work and for second-rate breeding-stock are 50 per cent lower than they were formerly, so that some farmers have ceased breeding them. Nevertheless, the Yorkshire studs easily maintain their supremacy in the show-ring, both as regards breeding-stock and harness animals; they also send out the largest proportion of prize winners, and the county is the principal breeding centre of pedigree Hackneys.

Two breeds of horses are exclusively claimed by Yorkshire: the Cleveland Bays and the Yorkshire Coach Horses. Although separate Stud-books were made for the two breeds in 1884 and 1886, they are not very different from one another.

The Cleveland Bays are a very old indigenous breed established in the county for a good many centuries, while the Yorkshire Coach Horse was evolved in the early part of the last century by crossing the Cleveland breed with a thoroughbred. Some breeders are of opinion that it would have been better to have included both breeds in a common stud-book. In America, this has been done, and Clevelands and Yorkshire Coach Horses are regarded as one breed.

The breeding of pedigree Cleveland Bays and Yorkshire Coach Horses is now concentrated in the hands of a comparatively small and decreasing number of breeders. About the thirties and forties, stallions of these races were imported into Germany and helped to found the Oldenburg coach-horse and the Hanoverian breeds. Later, stallions and mares were sent to Holland. The export trade reached its fullest development during the years of the American Cleveland boom, when some of the best stallions went to the States. Subsequently it fell off, the demand having turned to the North-German Coach Horse.

Coaching stallions still continue to be exported; the countries which chiefly buy them are the Argentine, Chile, the United States and Canada; Russia and South Africa have taken a few.

King Humbert was a great admirer of these Yorkshire breeds and bought upwards of a hundred geldings, mostly Coach Horses. Now, the Italian demand has ceased.

Shire horse breeding, though introduced at a considerably earlier period into Yorkshire, did not become of importance till about 1878. The rapid expansion of the industry at that time was due to the increasing demand for Shire draught horses of heavy type in the industrial centres; but great impetus was given by the formation of the Shire Horse Society.

In many parts of the county, the old Yorkshire farm horse is crossed with the Shire, and sometimes with Clydesdales.

Pony breeding is of little importance in Yorkshire. Some good Hackney-bred harness ponies are reared here, though the farmers occasionally breed a stylish pony of this kind from an ordinary pony mare put to a Hackney sire.

1067 Breeding and Exportation of Horses in Austria-Hungary in 1911.

— *Mitteilungen des K.K. Ackerbauministeriums über Pferdezuchtangelegenheiten*, No. 1. Wien, 11. April 1912.

In 1911, 2552 State stallions were used for service in Austria; of these, 1 477 were kept in the 437 stallion stations, 916 were in the care of private individuals and 159 were hired out.

Austria These stallions served 137 538 mares; on an average, one stallion served 53.9 mares. In addition, 373 stallions belonging to private owners had a service licence; these served 12 776 mares.

To increase the number of stallions in the two State studs and also in the State depôts, 250 animals were bought in 1911. The number of these, according to the breed were:

87 Pinzgau, 72 Belgians, 31 Oldenburgers, 15 English thoroughbreds, 15 Eastern half-breds, 10 Arabs, 8 English-half-breds 3 Anglonormans, 2 American Trotters, 2 Norfolks, 1 Hackney, 1 Lippizaner, 1 Konik, 1 Haflinger, and 1 Huzule.

In 1911, the export of horses for breeding and other purposes from Austria-Hungary amounted to 39 852 head, including 144 stallions and 382 brood mares.

The exports were divided as follows:

Italy	20 270	Russia-in-Europe	180
Rumania . . .	7 420	British India . .	37
Germany . . .	6 011	Egypt	8
Turkey . . .	2 496	Argentina	3
France	1 469	Belgium	2
Servia	950	Holland	2
Bulgaria . . .	607	Greece	1
Switzerland . .	293	Australia	1

SHEEP.

1068

MATTHEWS, J. WRENFORD. **Sheep and Wool for the Farmers: The Cross-Bred versus the Merino** (1). — *The Producers' Review*, Vol. VII, No. 1, pp. 25-33. Perth (W. A.), April 20, 1912.

Australia: New South Wales. New Zealand

The sheepbreeders of New South Wales have lately been devoting more attention to making crosses between Merinos and the English longwool sheep or downs, and the Government has tried to develop this cross-breeding by experiments on their experiment farms and by exhibiting the cross-breds at the shows of the N. S. W. Sheep Breeders' Association.

At the last show held by this Association, the N. S. W. Department of Agriculture exhibited 122 one-year-old and two-year-old cross-breds (first and second crossing) from crosses between Merinos and English longwool or down sheep.

The sheep came from the Wagga and Bathurst experiment farms and were weighed both on leaving the farm and on reaching Sydney, and then killed. The live weight, loss of weight during transport, and the carcass weight are given by the writer in exhaustive tables.

The flesh of the slaughtered animals was examined by two experts and proved suitable for the home market, as well as for export. For export, a sheep of 50-60 lbs. carcass weight is preferred; animals weighing more are not so much in requisition.

In the first-cross division of one-year-old animals, the Dorset-Horn × Merino took the first place, though the flesh is somewhat dark in colour.

The one year Southdown × Merino and the Border-Leicester × Merino of the first cross were not very suitable for export; the most suitable were the long-wool × Merino crosses and especially Lincoln × Merino.

The two-year animals of the first cross cut up better.

The best animals for the home market, as well as for export, were the second-cross generation, no matter whether the sheep were one or two years old. The Dorset-Horn × Merino took first place as regards weight; next to them came the Hampshire crosses. The Southdown × Merino and the Shropshire × Merino also cut up well.

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(1) See *B.* Nov.-Dec. 1911, No. 3193; Feb. 1912, No. 373 (*Ed.*).

Hitherto, cross-breeding has only been practised to any considerable extent in two parts of Australasia : New Zealand and Victoria.

Of the wool export of New Zealand in 1910-11, 97 % consisted of cross-bred wool; this formed 44 % of the wool exported from Victoria and only 6 % of that from New South Wales. Australasia produced in 1910-11 a total of 2 468 750 bales, of which 74 % were Merino and 26 % cross-bred. The rest of the world supplied during the same time 7 778 143 bales, of which only one third was Merino. Although these figures make no claim to absolute accuracy, they give a good idea of the extent of the breeding of Merinos.

It must be allowed that no other breed can beat the Merino on scanty pastures, in districts with little rainfall and occasional long periods of drought. Under such circumstances, the breed will always hold its own.

It is even possible that, with a reduced production of Merino wool, its price would rise considerably and breeding these sheep could be made a paying industry.

The Government of New South Wales has this point also under consideration, and intends to raise pure Merinos on the experiment farms in the dry districts of the west. Parts with a larger rainfall, where agriculture, in addition to sheep-rearing, is practised, are more suited to cross-breeding. On the one hand, the cross-bred sheep is better fitted for intensive production, and on the other, it pays better than the pure bred sheep, being a dual purpose animal.

POULTRY.

1060 LAURIE, D. F. **Egg-Laying Competitions,** — *The Journal of the Department of Agriculture of South Australia,* Vol. XV, No. 9, pp. 911-917. Adelaide, April 1912.

Australia

At the Roseworthy Poultry Station, eight tests have so far been held between different breeds of fowls. The last test was started on April 1, 1911 and terminated on March 31, 1911; it included 126 pens of fowls, each containing 6 birds. The fowls belonged to Australian poultry breeders, and were divided into two chief sections: I, light breeds; II, medium and heavy breeds.

The results are given in the following list:

Number of pens	126
Number of fowls	756
Total number of eggs laid	133 093
Total value of eggs laid	£545 6*s* 2.7*d*
Total cost of feeding	£188 14*s* 9.5*d*
Gross profit	£356 11*s* 5*d*
Average market price of eggs per doz.	11.8*d*
Average number of eggs laid per pen.	1 056.29
Average number of eggs laid per hen.	176.04
Cost of food per pen of 6 hens.	£1. 9*s* 11.5*d*
Cost of food per hen.	4*s* 11.5*d*
Gross profit per pen.	£2 16*s* 7.3*d*
Gross profit per hen	9*s* 5.2*d*
Eggs laid by winning pen, Section I	1 589
Eggs laid by winning pen, Section II	1 189
Highest monthly score, Section I	163
Highest monthly score, Section II	135
Highest weekly score, Section I	40
Highest weekly score, Section II	38
Highest average per hen: pen 98	264.83
Highest egg score: pen 98	1 589

In section I, as generally, the superiority of the White Leghorn as a layer is shown; in section II, the Langshans laid the largest number of eggs.

Further data are given in the following table.

Section —	No. of pens	No. of hens	Breed —	Total eggs laid	Average per pen.	Average per hen.
I	100	600	White Leghorn	108 472	1 084.7	180.7
	1	6	Minorca	1 001	1 001	166.8
II	3	18	Langshan	2 943	981	163.5
	15	90	Black Orpington	14 502	966.8	161.1
	4	24	Silver Wyandotte	3 641	910.2	151.7
	2	12	Buff Orpington	1 710	855	142.5
	1	6	White Orpington	824	824	137.3

Pen No. 98 has, with a score of 1 589 eggs, established a record. It comes from the Caulfield poultry farm in Victoria.

At Kybybolite, there was also a competition between 47 pens of hens. The winning pen there laid 1 464 eggs. From these facts, it can be seen that poultry-breeding in Australia has already reached a high level. We may add that, in the above-mentioned paper, not only are the total results of the competitions given; but also the number of eggs produced by each pen, and the addresses of the poultry owners.

1070 **The Wholesale Egg Trade of Berlin.** (Der Berliner Eiergrosshandel). — *Deutsche Landwirtschaftliche Geflügelzeitung,* 15. Jahrgang, No. 32 and 33, pp. 453-455 and 469-471. Berlin, 9. und 16. Mai 1912.

Germany

The demand for eggs in Berlin is met almost exclusively from abroad; by far the larger number of the imported eggs come from Russia and Austria-Hungary. In 1900, about 66 million lbs. of eggs were imported into Berlin, while in 1910, the figure reached 92 ½ million lbs., which is more than a quarter of the whole German import trade.

The eggs are sorted in the countries where they are produced, according to size and quality, and are packed 1 440 in a case. A railway truck can take 100 cases.

The wholesale price for perfectly fresh foreign eggs in June 1910 was 3.60 M. (3*s.* 6*d.*) for 60 ; for not quite fresh ones, 3.15 M. (3*s.* 2*d.*). In December of the same year, quality I cost 5.81 M. (5*s.* 8 ½*d.*) per 60, and quality II 4.56 M. (4*s.* 6 $^3/_4$*d.*). The native eggs were chiefly sold as " new-laid eggs " (*Trinkeier*) to hotels, hospitals, retail-traders and private customers at a higher rate.

In summer, the difference in the price of native and foreign eggs is not great, for the latter then also reach the market perfectly fresh. In winter, on the contrary, the foreign merchants, speculating on the higher price of winter eggs, often send less fresh eggs and this causes the new-laid German eggs to advance considerably in price. Denmark and Holland also supply fresh winter eggs; these are carefully sorted, and often obtain higher prices than the German eggs.

In summer, at the time when eggs are most abundant, large numbers are placed in cold storage depôts at a temperature between — 1° and + 1° C., and with 80 % of atmospheric moisture. They remain there 5 to 7 months. On being taken out of cold storage, the egg cases are first placed in a store-room, where the temperature is somewhat higher than that of the cold-storage depôt. The air in this room is dried by a patent system. Without these precautions, the eggs would quickly go bad. Lying in the cold storage depôt for 5 months does not change the eggs appreciably, and it often happens that cold storage eggs are, to the detriment of the German producers, sold in retail trade as new-laid eggs. Cold storage eggs even serve as a subject of speculation on the Stock Exchange.

Since 1909, the Berlin wholesale egg trade has been organised by police regulations like the Stock Exchange. Four weekly egg-markets are held in a room of the Stock Exchange. Twice a week their price is noted and published by an official commission. This price is the standard for the whole Berlin egg trade.

The Associations of the Berlin egg-exporters and wholesale egg-dealers are attempting to turn the egg market into a regular egg exchange (" Eierbörse ") with an Exchange Judicial Committee, in order that fraud may be suppressed.

BEES.

MERLE, C. **Bee-keeping in 1912.** (L'apiculture en 1912). — *La Vie Agricole et Rurale*, No. 23, pp. 637-640. Paris, 4 mai 1912. **1071**

France

1. *Improvement of bees.* — In 1908 M. Pincot demonstrated the possibility of obtaining larger workers by simply enlarging the cells, and thus ensuring a heavier yield of honey. M. Pincot, as a result of numerous experiments, affirms that bees bred in combs containing 47 cells to the square inch produce decidedly more honey than those bred in ordinary combs (55 to the sq. inch, and exceptionally 51).

These experiments are very interesting, but they do not lead to an improvement of the breed, as they deal with the sexless insects, instead of with those possessing the organs of reproduction, and it is only by the selection of the latter insects that a lasting and transmissible improvement of the breed may be secured. Some bee-keepers have obtained important results by this method, though they have encountered no slight difficulties, which are all the greater owing to the fact that the selection of the drones to mate the queens does not depend entirely upon the will of the keeper.

2. *Errors of bee-keeping science.* — It has been recognised that there is only one queen to every hive, and that if several queens could be found together at a given moment, it was only for a very limited period. Now several American bee-keepers have published reports of numerous instances of plurality of queens. One of them has even succeded in introducing as many as 14 queens in one hive and making them live together in harmony. If this could be

done, the densely populated hives which are the best, would be easy to obtain and bee-keeping would become highly remunerative.

Dzierzon's theory of parthenogenesis, or generation from virgins, is now combated by Dickel. According to Dzierzon's theory the following practical conclusions are arrived at:

a) An unfecundated queen may lay eggs which, not being fecundated, give birth only to drones.

b) An old fecundated queen, but whose spermatheca is exhausted, may still continue to lay, but her eggs, not fertilised by the male, will produce only drones.

c) Workers also may, under certain conditions, lay eggs, which also will produce only drones.

According to Dickel it is the workers or the nurses, and not the queens, who determine the sex. This new theory seems to gather followers.

3. *Are drones injurious to the yield?* — Opinions are divided. M. Bourgeois of Tunis has recently reported on an important experiment dealing with 150 colonies with drones and 150 without, all in the same apiary, and during 5 consecutive years. The financial results were identical in both cases. M. Bourgeois concludes: " The bee-keeper need not trouble about the presence of drones except in the case of a whole laying of drone-producing eggs or of a declining queen ".

4. *The sense of direction in bees and the position of the hives in regard to the cardinal points.* — Experiments carried out by M. Bonnier have demonstrated, beyond discussion, that the sense of direction in bees is much more important than that of sight and that they possess it in a more marked degree than carrier pigeons. It is quite independent of the sense of sight and is wonderfully keen, especially as regards height, being somewhat less so in a lateral direction.

Practical conclusions may be drawn from these observations, namely that beekeepers make a mistake in keeping their hives in straight lines, and that the use of different colours is a very insufficient guide for bees. The risk is run of causing fights at the entrances of the hives, and, what is still more serious, of losing the queens returning from their marriage flight. It is much preferable to vary the position of the hives in regard to the South and the East and especially to arrange the entrances of neighbouring hives at different levels.

The Fifth Statistical Return of the Swiss Bee Swarms in 1911. (Le 5^e Recensement Suisse des Essaims d'Abeilles en 1911). — *Le Paysan Suisse,* 12^e Année, No. 5, p. 19. Porrentruy, mai 1912.

1078

Switzerland

The fifth census of the Swiss bee swarms was taken in 1911, at the same time as the seventh cattle census, and shows a constant decrease in the number of swarms.

The following are the number of hives in the different years:

1876	1886	1896	1901	1911
177 120	207 384	254 109	242 544	223 923

From these figures, we see the decrease has been 12 % since 1896. It is due to the ravages of the "loque", of dysentery and of other diseases.

Further, the considerable importation of foreign (Italian and Carniolan) bees in the eighties and early nineties has not been attended with the anticipated success, and the colonies died as fast as they increased.

Other causes of the decrease in bee-keeping are the migration of the rural population to the towns, and the complicated nature of modern apiculture, which has replaced the straw hive by a wooden one and the fixed structure by a movable hive. The effect of this last change is shown by the concentration of hives in the hands of bee-keepers. The average number of hives per bee-keeper in Switzerland in 1876 was 4.3, in 1886 it rose to 5, in 1896 to 5.2, in 1901 to 5.7, and at the present time it reaches 6.7.

Taking the whole population, the number of hives is 62 per 1000 inhabitants; in Germany it is only 46 and in Austria-Hungary 38. The Cantons Lucerne and Zug are those which give the highest returns in Switzerland, 142 hives per 1000 inhabitants in the former, and 111 in the latter.

In the census of 1911, for the first time, a distinction was also drawn between straw hives and those made of wood, and between movable frames and fixed structures. The figures showed that of the total number of Swiss hives, about 80 % were constructed with movable frames and only 20 % were fixed.

SILKWORMS.

1078 **The World's Production of Silk in 1911.** (La Production de la soie dans le monde en 1911). — *Bulletin des Soies et des Soieries*, 36e Année, No. 1827, pp. 3-4. Lyon, 11 mai 1912.

The Syndicate of Lyons Silk Merchants has published the general statistics of silk production. The statistics are provisional as regards exportations from the Far East. The following are the figures in kilograms (1 kg. = 2.2046 lb.):

Western Europe

Western Europe	1910 Fresh cocoons	1910 Raw silk	1911 Fresh cocoons	1911 Raw silk
France	4 270 000	318 000	5 109 000	402 000
Italy	47 964 000	3 947 000	41 951 000	3 490 000
Spain	1 115 000	83 000	1 160 000	88 000
Austria-Hungary:		352 000	4 194 000	355 000
Trent	1 850 000			
Görz and Gradisca	373 000			
Istria	60 000			
Croatia-Slavonia	255 000			
Hungary	1 645 000			
Total	57 532 000	4 700 000	52 414 000	4 335 000

Near East & Central Asia.

Western Europe	1910 Fresh cocoons	1910 Raw silk	1911 Fresh cocoons	1911 Raw silk
Asiatic Turkey:				
Anatolia	5 760 000	480 000	6 115 000	510 000
Syria (Cyprus)	6 230 000	540 000	5 900 000	515 000
Other Provinces	1 552 000	130 000	1 600 000	135 000
Turkey in Europe	4 316 000	360 000	4 350 000	365 000
Bulgaria Servia Roumania	2 106 000	175 000	2 330 000	195 000
Greece & Crete	725 000	57 000	830 000	65 000
Caucasus	—	520 000	—	480 000
Persia & Turkestan (Exportation)	—	538 000	—	550 000
		2 800 000		2 815 000

Far East.

	Fresh cocoons (bales)	Raw silk	Fresh cocoons (bales)	Raw silk
China	—	—	94 000	—
Exportations from Shanghai	87 939	5 193 000	or 495 000	5 550 000
» » Canton .	54 924	2 637 000	35 225	1 690 000
Japan	—	—	150 000	—
Export. from Yokohama .	148 005	8 935 000	or 155 000	9 200 000
India	—	—	—	—
Export. from Bengal and Kashmir	2 968	230 000	2 626	215 000
Total . .		16 995 000		16 655 000
Total for the World		24 495 000		23 805 000

The year 1911 marks an arrest in the progress of the world's supply of silk factories, a progress shown in the following table of the world's output of silk, the figures given representing tons of 1000 kg.:

Period	Europe	Near East and Central Asia	Far East	Total
1876-1880 (av.)	2 475	639	5 740	8 854
1881-1885 (av.)	3 630	700	5 108	9 438
1886-1890 (av.)	4 340	738	6 522	11 600
1891-1895 (av.)	5 518	1 107	8 670	15 295
1896-1900 (av.)	5 220	1 552	10 281	17 053
1901-1905 (av.)	5 312	2 304	11 476	19 092
1906	5 748	2 624	12 541	20 913
1907	5 909	3 026	13 125	22 060
1908	5 551	2 693	15 836	24 080
1909	5 385	3 038	16 087	24 510
1910	4 700	2 800	16 995	24 495
1911	4 335	2 815	16 665	23 805

FISH.

ECKSTEIN. **Experiments with Different Foods for Carp.** (Erfahrungen mit Karpfenfuttermitteln.). — *Fischerei-Zeitung*, Bd. 15, No. 20, p. 249. Neudamm, 19. Mai 1912. **1074**

Germany

The writer tried the following substances as food for carp:

1. *Acorns.* These were collected in the autumn, spread out in an attic to dry, and later placed in heaps and turned over from

time to time. When required for food, they were crushed, and mixed with water immediately before use; the fish took this food very readily.

2. *Cockchafers*. After these had been killed with bisulphide of carbon, they were dried on a kiln. Shortly before use, they were reduced to powder by means of a rolling-pin. This powder was mixed with an equal quantity of rye-bran and then little pellets were made. The latter were thrown into the water to the fish. This mixture possesses about the same nutritive qualities as a mixture of maize and lupins.

3. *Horse-chestnuts*. The carp refused these on account of their bitter taste.

4. *Pancreas*. Maize-meal was mixed with the finely shredded pancreas of cows and pigs and this compound was given to the fish. The pancreas was added with the view of facilitating the digestion of the large amount of food given. The experiment did not prove successful.

5. *Concentrated Food of the Treuenbrietzen Lupiscin Factory*. This food was used with much success for carp of one summer's growth; these developed excellently, and in some cases reached a weight per head of nearly 19 oz.

1075 PARKER, G. H. **Effects of Explosive Sounds, such as those produced by Motor Boats and Guns, upon Fishes.** — *Bureau of Fisheries, Document No. 752*. Washington, 1911.

United States

Fishermen and naturalists have long ago affirmed that fishes notice sounds, but it is only quite recently that it has been demonstrated that they are enabled to do so by means of their skin and of the lateral lines. The Author believes from experiments made on the subject that the inner ear also of fishes serves for hearing.

The Author raises the question and examines it, whether fishes are disturbed by the explosive sounds produced by motor boats. As a first step a man dived under the water when a motor boat passed within 10 or 12 feet of him: he heard the explosion noises only faintly when the mouth of the escape pipe was out of the water, and still less when it dipped under the surface. This shows that the greater part of the sound is reflected from the surface; besides, very little sound is produced when the escape pipe dips under the surface.

The effect of motor boat noises was tried with several species of sensitive fishes, such as killifish (*Fundulus heteroclitus*), young scup (*Stenotomus chrysops*), young kingfish (*Menticirrhus saxatilis*) and mackerel (*Scomber scombrus*), in various experiments.

The fish were placed in a box with net sides to it, and kept in tranquil waters; they were then watched when a motor boat passed. When fish are disturbed they go down into deeper water. In the above experiments no commotion among the fish could be perceived, except when the boat came so near that they could feel the motion of the waves. The explosion noise of the boat motor did not disturb the fish, both when the mouth of the escape pipe was out of the water and when it was under. The experiments were repeated with other kinds of fish which were being fed. The fish left off eating only for a short time when the boat came quite close to them. Other experiments with the reports of fire arms show that the fish are momentarily disturbed when a shot is fired very near, but that the disturbance is only temporary.

It may be added that several fishes such as drumfish (1) and squeteague (2) produce sounds which are considered as means of attraction and connected with sexual life.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

LECLER, P. **The Applications of Electricity in Agriculture.** (Les applications agricoles de l'électricité).—*Bulletin de la Société des Agriculteurs de France*, pp. 449-456. Paris, 1er mai 1912. **1076**

France

In the employment of electricity in the interior of farms it does not appear that much use has been made of electric motors, which allow the motive power to be easily subdivided. Nevertheless in order to reduce manual labour to a minimum, almost all the inner work of the farm might be performed by electricity, such for instance as preparing the crops for storage (threshing), carrying them to and from the granary, and preparing them for the farm animals (chaff-cutting, root-slicing, grain-crushing). Hitherto each of these operations has been considered by itself, whereas it would be advantageous, in large farms, to connect them with each other and with the granaries, silos, etc., by means of electric transport.

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(1) *Pogonias chromis; Aplodinotus grunniens; Sciaena ocellata.*
(2) *Cynoscion regale.* (*Ed.*).

But it is especially tillage that consumes the greatest amount of energy. The plough for deep work requires great traction power, which can only be supplied by fixed winches and not by motors travelling over the fields. Also the various anchoring apparatus do not appear hitherto to have given on the whole very brilliant results. This is chiefly owing to temporary anchorages in the soil being resorted to, and their stability varies with the season and the weather.

The complete solution of the problem will be reached when the fully industrial nature of farming is recognized, when farms are provided with permanent roads offering at all times rapid and reliable anchorage to the drums, so that these may be employed with the least waste of time for all the work of tillage. Besides, roads connected with the centre of the farm afford every facility for the carriage of crops and manures. In very large farms the building of roads and anchorages 550 yards apart (a convenient distance for mechanical ploughing) would only entail about 110 yards for every 12.4 acres. The cost per acre would be about £ 8, of which sum 10 %, or 16 *s.* per acre, would amply cover upkeep, interest and amortisement.

1077 COFFIN, EMMANUEL. **Agricultural Motors and Machines at the Champagne Farm, near Paris.** (Les moteurs et les machines agricoles à la ferme de Champagne, environs de Paris). — *La Vie à la Campagne,* Vol. XI, No. 133, pp. 215-216. Paris, 1 avril 1912.

France

The farm of Champagne, where for many years systematic cultivation has been practised, contains 210 ha. (521 acres). The number of agricultural implements used there increases every year. At present there are, for the outdoor work of the farm: 4 Brabant ploughs, 3 Brabants with open mouldboard, 3 stubble ploughs with 4 shares, 4 extirpators, 7 sets of large wooden harrows, 5 sets of iron harrows graduated as to strength, 2 clod crushers, 4 grooved cast-iron rollers, one manure spreader of 9 ft. 9 in., 1 Smith spreader of 9 ft. 9 in., 1 large hoe 9 ft. 9 in., 2 small horse hoes, 2 reapers, 2 binders, 1 harvester, 1 Decauville engine with 1 500 yards of rails and 24 trucks, 5 large two-wheeled waggons for hauling

Costs of power of locomotives using producer-gas, electricity and benzol, for powers below 15 HP.

Generation of power	Locomotive of 10 HP	Producer-gas engine of 17 HP	Dynamo of 6 HP worked by steam engine	Dynamo of 6 HP worked by producer-gas engine	Benzol motor of 12 HP
Cost of motors and buildings	£258	£646	minimum £124 12*s*	£124 12*s*	£120
Expenses per day (200 days per year):	for 5 H P	for 15 HP	for 5 HP	for 5 HP	for 5 HP.
Interest on capital (4 %).	1*s* 0*d*	2*s* 7*d*	6*d*	The cost per HP. hour is only exact where the available 10 H P. of the gas engine can be used simultaneously for other work. Otherwise it is too low.	5 $^3/_4$*d*
Upkeep and amortisement of buildings (5 %)	—	11*d*	—		—
Amortisement of motor (5 %)	2*s* 7*d*	4*s* 7*d*	1*s* 3*d*		1*s* 2*d*
Upkeep	1*s* 0*d*	1*s* 3*d*	1*d*		2 $^1/_2$*d*
Combustible	4*s* 9*d*	3*s* 5*d*	—		3*s* 2*d*
Lubricants	9 $^1/_2$*d*	9 $^1/_2$*d*	1 $^1/_2$*d*		9 $^1/_2$*d*
Water to be carted or pumped	220 gals.	1 540 gals.	—		1 gal.
Wages of labour	4*s* 0*d*	4*s* 0*d*	—		9 $^1/_2$*d*
Total	14*s* 1 $^1/_2$*d*	17*s* 7*d*	1*s* 11 $^1/_2$		6*s* 7 $^1/_2$*d*
Cost of moving Time required for moving	7 $^1/_2$*d* 1 hour	1*s* 7 $^1/_2$*d* 45 minutes	As for locomotive.	As for gas-engine	None
Price per HP.-hour	3.6*d*	1.4*d*	4.9*d*	At least 2.2*d*	1.6*d*

NB. — The results of columns 1, 3, 4 and 5 alone are strictly comparable. The gas-engine results (col. 2) were obtained when the engine was working at full charge, giving the maximum efficiency.

to Paris, 4 ordinary four-wheeled carts, 12 large and 4 small dung-carts. For inside work there are: 1 thresher, 1 Josse grain cleaner, 1 cleaner with sieves, 1 American winnower, 1 presser, etc. All these cleaning machines, as well as the thresher, are driven by a 10 HP. motor.

The cultural operations are carried out either with oxen or, during the past year only, with a 30 HP. tractor (1).

The thresher is a movable machine with a slow rotation of the drums (450 revolutions) so as not to bruise the straw, which is part of it sold off. It can thresh 1 200 to 1 500 sheaves a day, which gives 8 800 to 11 000 lbs. of grain. It is furnished with a double cleaner and a fixed American winnower for cleaning oats. It is driven by an explosion motor. This motor is mounted on a small four-wheeled cart, which also carries a tank for the cooling water and can be carried about with the thresher; it has two cylinders; its normal speed of rotation is from 400 to 450 revolutions; it consumes 3.1 to 3.3 gallons of benzol in a threshing day of 10 hours.

M. Petit, the owner of the farm, recently sent to the Society of Agriculturists of France the accompanying table of the cost price of motor power.

1078 MARTINY. **The Present Status of Motor Ploughing in Germany** (2). — *Kühn Archiv.*, Band 2, Erster Halbband, pp. 191-229. Berlin, 1912.

Germany

Motor ploughs that are not hauled by a cable can utilize only a part of their power for tilling the soil, because the rest is consumed in their propulsion. This resistance varies with the load on the wheels, with the depth to which they sink in the soil (3) and inversely with their radius.

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(1) See *B.* Feb. 1912, No. 365. (*Ed.*).

(2) See *B.* Nov.-Dec. 1911, No. 3223; Jan. 1912, No. 184. (*Ed.*).

(3) A wheel with a smooth tyre, that is one without special projecting parts to ensure purchase, requires for its progress on the flat, a force P acting in a direction parallel to the ground

$$P = 0.530\ G\sqrt{\frac{t}{r}}$$

in which G is the load on the wheel, t, the depth to which the wheel sinks into the ground, and r its radius.

The builder must therefore keep the load on the wheels as small as possible, whilst giving them a large radius and, to prevent them sinking into the ground, a sufficiently broad tyre.

For the forward motion of a motor plough the build of the tilling parts is very important.

Two systems are used:

1. Common plough frames as in the team paring-ploughs. (Hobelpflug). Representatives of these types are Stock's motor-ploughs (Berlin) and the "Ihacé" motorplough.
2. Revolving cylinders fitted with blades which detach small fragments of soil and throw them behind (Fräserpflug.). The "Köszegi" agricultural motor is built on this system.

The paring plough draws its ploughshares after it, and the resistance of the soil is overcome by traction power; whilst in the second type the cylinder bears the working blades which in revolving butt against the soil and thus the machine requires only driving power and no haulage. Its forward motion is due to the purchase of the wheels on the soil. This grip increases with the load. but as this increases the resistance, the purchase is increased by fitting the tyre with projecting parts, which in the "Ihacé" plough are broad and flat, as in the American motor ploughs, and in "Stock's" machine they are long and knifelike and arranged nearly radially.

These blades penetrate into the soil and prevent skidding even on wet ground. For travelling on roads these grips must be removed.

The picking machine (Fräserpflug), which requires less traction than the paring plough, has less need of grips on the tyres, and its weight can also be kept lower.

In "Stock's" plough the coupling between motor and ploughs is rigid. as they are mounted on the same frame, the motor in front of, and the ploughs behind, the driving wheels. This has the disadvantage that any vertical motion of the motor is transmitted to the ploughs, causing them to work irregularly as to depth. On the other hand, as the weight of almost the whole of the

The formula however holds good only under the condition that the resistance of the soil is proportional to its change of form under compression.

The author, with the help of the above and other formulae has calculated the resistances to be overcome by the various motor ploughs he reviews.

outfit is borne by the axle of the driving wheels their grip is greatly favoured. A small portion of the weight is borne by the steering wheel at the rear of the frame. In the "Ihacé" the ploughs are loosely hitched to the motor that hauls them.

In the "Köszegi" plough the roller bearing the working blades is coupled to the motor in such a fashion that when the latter crosses a furrow, for instance, the blades continue to work to the same depth.

The mobility of the "Stock" plough is inferior to that of the "Ihacé" Its motor cannot back, and if one of its ploughs is held up by a large stone, this must be dug out or the whole plough lifted over it by means of a jack. In such a case the "Ihacé" motor could be uncoupled from the plough, haul the stone out of the field and then resume its work.

In the "Stock" plough the power and the resistance are kept in the same line by making one of the wheels travel in the furrow. In order to keep the plough as nearly level as possible the axle of the work wheel is 6 inches lower than that of the land one. Of course in ploughing to a greater or lesser depth the whole outfit is slightly inclined to the right or left. The variation in the depth of work is regulated by the elevation given to the steering wheel.

In those outfits in which the motor wheels on both sides run on the unploughed land the power and the resistance do not coincide in the same line; the work wheel must bite more than the land wheel, otherwise injurious lateral strains come into play which tend to push the front wheels of the motor in one direction and the hind wheels in another.

Both the "Stock" and the "Ihacé" outfits can plough to a depth of 14 in.

The "Köszegi" hitherto attained only 8 inches, but it appears it will now reach 12 in. As for uniformity of work the first two machines are somewhat inferior to a skillfully managed team plough, but they crumble up the soil more throughly and save some harrowing. With the "Köszegi" the soil to the whole depth of work is broken up as fine as garden mould and is at once ready for sowing. It remains to be seen whether this fine preparation is an advantage or not in field work.

When a ploughshare of a motor multiple-plough strikes a firmly embedded stone the danger of breakage is considerable. To meet this the "Ihacé" has each plough fixed to a lever, so that it may, on meeting a stone, jump out independently of its neighbours. In a recent model each plough can revolve round a bolt, and is kept in position by a wooden peg which breaks when the strain is too great, and allows the plough to turn round the bolt.

As motor power for ploughs in Germany internal combustion has been preferred to steam, as the former engines can be made lighter in build and thus offer less resistance. They are besides cheaper than steam engines, though they require a greater expense for fuel.

In order to build light motors those with a high number of revolutions per minute were chosen. The "Stock" motor makes 720, the "Köszegi" 520 and the "Ihacé" 240 to 335.

Motors of automobiles have still higher figures.

With the "Stock" plough a good deal of practical experience has been gained. It is especially built for the well cultivated clay lands of Germany, but it does good work also both on heavier and lighter soils. Hitherto, however, it has not been sufficiently tried on wet lands. In dry fields it works well, on hilly ground its performance diminishes, and for stony land it is not adapted. It can be used both for deep and for shallow ploughing. It works usually with 6 shares, but only with 4 somewhat larger ones when manure has to be turned under. Harrows can be hitched behind the ploughs. The area ploughed per hour varies between 0.8 and 2.5 acres. One good driver is required and the assistance of another man is useful.

The "Ihacé" plough is specially built for dry soils and has succeded where the use of team ploughs was not possible on account of the drought. In especially heavy work the number of shares is reduced. When manure is turned under disc shares are used. The motor can be used for hauling waggons on roads or for driving machines such as threshers. The "Ihacé" plough has not yet done so much practical work as the "Stock" and this is to be borne in mind in considering the accounts given below.

The "Köszegi" ploughs were only last year taken in hand by the Firm H. Lanz of Mannheim and a number of them are now being tried. They do not appear to be adapted for stony and hilly land, but are excellent for breaking up pastures and heaths. The soil is uniformly and thoroughly loosened and thus absorbs well the rain. The motor develops 60 H. P. and can be used for hauling waggons or for driving machinery.

The following table is based on the experiments hitherto made:

Plough	"Stock"	"Ihacé" I	"Ihacé" II
Power of motor.	42 H. P.	20 H. P.	45 H. P.
Price	£833.6*s* 8	£735.5*s*	£1125.9*s*
Area ploughed 8 inches deep per hour	1.48 acre	1.11 ac.	2.03 ac.

Daily expense, working 100 *days of* 12 *hours per year.*

	£	s	d	£	s	d	£	s	d
Interest, amortisement, repairs 25 %	2	1	7	1	16	9	3	6	2
Benzine	1	17	8	1	13	3	3	0	2
Lubricants		7	6		6	8		12	1
2 Drivers		11	9		11	9		11	9
2 Ploughmen		—			6	10		6	10
Sundries		5	10		5	10		5	10

Area ploughed eight inches deep in 12 *hours.*

17.78 acres 13.34 ac. 24.20 ac.

Cost per acre.

5*s* 10*d* 7*s* 11*d* 6*s* 9*d*

1079 **A New Automobile Plough.** (Une nouvelle laboureuse automobile), — *La Vie à la Campagne*, Vol. XI, No. 135, pp. 294-295. Paris, 1er mai 1912.

France

The implement in question is the Vermond-Quellennec plough; which, since its invention in 1905, has undergone many and various modifications. It consits of a rotatory machine with rigid working parts. The latter are arranged so as to avoid the inconvenience of getting blocked either on heavy soil, or by means of plants pulled out of the ground, and permit of ploughing soil containing a large proportion of big stones, without other inconvenience than that of twisting one or two portions, which can be easily repaired at the forge, or replaced.

A single explosion motor drives both the moving wheels and the rotating portion, while two levers are sufficient for working the machine. The motor, as first designed, and until tested in 1911-1912 on the stony soil in the neighbourhood of Lyons, consumed only oil, the high price of which greatly increased the working cost; a new motor has now been substituted, which can use pure petroleum, carburetted alcohol or benzol.

The machine is furnished with a 4-speed gear and reversing apparatus. It gives the following results:

1st speed 5 250 ft. per hour;
2nd speed 7 870 ft. »
3rd speed 11 800 ft. »
4th speed 17 700 ft. »

The depths of the corresponding ploughing, measured by the unploughed land, and not the depth of the work, are:

1st speed 10 to 12 in.

2nd speed 8 3/4 to 10 in.
3rd speed 6 to 7 in.
4th speed 3 1/4 to 5 in.

The width traversed by the working-part is 5 ft. 7 in. and reaches beyond the wheel-tracks, so that these run always on the land and never on the work.

Allowing for loss of time in turning, etc., the results are as follows:

Work in a 10-hours' day.

Depth: inches	Speed: miles per hr.	Worked area: acres
3 to 4	3 1/3	20
6 to 7	2	12 3/4
8 3/4 to 10	1 1/2	8 3/4
11 to 12	1	6

Thus, in ordinary ploughing, the machine could easily accomplish 12 1/2 acres per day.

The article is illustrated with four photographs, which show the plough at work, the manner in which it breaks up the soil, the ease with which it is handled, and its flexibility, which allows it to work even while turning.

A Hand-pushed Hoe with Interchangeable Blades for Horticultural Work. 1080

(Houe à bras à socs interchangeables pour l'éxécution rapide des travaux d'horticulture). — *La Vie à la Campagne*, Vol. XI, No. 134, p. 266. Paris, 15 avril 1912.

France

In its essential parts, this tool consists of two handles, two wheels and a frame. To the latter are affixed the working portions, which may be either two mould-boards, two hoe-blades or four cultivator teeth, the distance apart of which, thanks to a sliding arrangement, can be varied at will; the distance of the wheels can also be changed. In front of each is a shaft, which raises drooping leaves without crushing them.

When in use, the worker pushes the implement before him a little faster than ordinary walking pace, and at each step gives it a push varying in force with the resistance of the ground. For very careful hoeing, from two to four pushes instead of one are necessary. The mould-boards should be used converging towards the row in all earthing-up operations. For levelling and baring the roots of the plants, divergent mould-boards are used.

This hoe is used for all kinds of hoeing in M. Trébignauds' kitchen and fruit garden near Paris. The first time, in spring, the cultivator teeth are employed for breaking up the clods and levelling the ground. Later on in the season, the hoe-blades are used. With this apparatus, a man can hoe in a day over an area three times as large as a good workman with an ordinary hoe (the latter can do 32 to 48 rods a day earning 6 to 9 fr. *i. e.* 4*s.* 9*d.* to 7*s.*).

In rows of opposite espaliers, it is possible to approach within 4 in. of the trees, thus leaving only 8 in. to be done by hand in each row. In plantations of cup-shaped pears in rows 8 ft. apart, the machine can go twice up and down between each row; the spread of the branches (the trees are cups grafted at 10 in.) prevents working the machine nearer than 16 to 20 inches, so that a strip 2 ft. 6 in. to 3 ft. 3 in. wide must be gone over with the ordinary hand-hoe. The work in this case is somewhat slower, but nevertheless much quicker than if all were hoed by hand.

Last April, this push-hoe was used to hoe a square of oxheart cabbages planted in December. It took only four minutes to hoe each bed 33 yards long containing five rows of cabbages, while it would have taken about 25 minutes to do the work with a hand-hoe. The area hoed being 40 rods the labour was reduced from 5 ½ hours to 52 minutes (13 beds 6 ft. 6 in. wide, with 12 paths 16 in. by 98 ft. 6 in.). Thus 4 ½ hours were saved.

The same implement, furnished with the four cultivator teeth 4 in. apart, was also used for a square of white onions planted in November in rows only 3 ¼ in. apart, there being 4 in. between each onion. As it was impossible to hoe along the rows, the square was hoed across, and the work accomplished at the rate of 60 minutes for 40 rods. Done by hand, 30 hours would have been expended on the task.

BUILDING-CONSTRUCTION.

1081 LECLER, PAUL. **The Removal of Waste Products by Means of Cesspools.** (Evacuation des Déchets par les Fosses septiques). — *Bulletin de la Société des Agriculteurs de France* (Supplément au Bulletin du 15 mai 1912), 44e Année, 2e Fascicule, pp. 583-593. Paris, 15 mai 1912.

In all dwellings, the removal of the liquid and solid waste products is a matter for consideration. France

In agricultural districts this can be effected by the use of small movable buckets, of stationary receptacles or cess-pools, which may be completed by bacterial filter-beds.

The movable buckets do not necessitate a fixed system, and when the work of their removal is well organized, they allow of waste products being taken away from the dwellings before they have had time to decompose. But the receptacles should not be arge, in order that they may be removed without difficulty. Therefore it is necessary for them to be changed frequently, which is a heavy tax. Further, portable buckets are not much to be recommended.

Fixed cess-pools are preferable and these should be of sufficient capacity to receive the waste products of a fairly long period, of many months or even a year. These fixed cess-pools are nearly always subterranean; they receive the waste from a fall pipe with a branch carried up above the roof of the dwelling to allow of the escape of toxic and inflammable gases.

The system most to be recommended is that of cess-pools with the addition of bacterial beds. The cess-pools are not costly, do not take up much room, are solid, last indefinitely, and when once fixed, require practically no supervision or repairs (a complete emptying after 20 years). They transform the waste products into a liquid or *effluent* more or less coloured, with little odour, considerably less injurious than the products themselves and which it is very easy to remove to a distance without danger of contamination (they can, for example, be conducted into liquid manure pits).

If this liquid is passed through bacterial beds, it becomes purified to the extent that it can be disposed of without danger practically anywhere. In cess-pools, the waste products are destroyed by anaerobic fermentation. Thus, they must not be ventilated but should be hermetically closed, and the fall pipe should descend into the liquid, as should also the pipe for the removal of the effluent, which should be a siphon. In any case, to prevent the pressure of the gases occupying the empty space above the liquid from becoming dangerous, it is necessary that a small supplementary siphon should be made, or else a hole of small dimensions opening into the air.

The effluent should be run off (with or without bacterial beds) by open channels, rather than by means of closed pipes, for in the former case the oxygen of the air, the ultraviolet rays of the light, and aerobic bacteria have more power to destroy pathogenetic germs.

If the slope is sufficient to allow of some little waterfalls being made in its course, the purification of the effluent is still more complete.

In practice, the best cess-pool is that which consists merely of the necessary elements, *viz.* a water-tight receptacle which receives the fall pipe, a siphon at the exit and a separating division. It is well to bend the lower end of the pipe, or to make it discharge above an inclined shelf in order that the products may be better mixed. This pipe, which has a diameter of 6 to 7 in., descends about 12 in. below the level of the liquid, in order that the falling substances may not disturb the superficial layer where the bacterial action is most intense. Further, it must stop at a certain distance from the bottom to allow of the gradual deposition of inert substances, sand, etc.

The division which separates the fall pipe from the evacuation siphon is provided in the lower portion with perforations, which place the two compartments in communication. The position of the siphon is so regulated that the liquid does not rise to the top and remains below the upper part of the separating division. Some makers completely close the upper part of the cess-pool; but it is preferable to provide it with a trap of sufficient size to prevent foreign bodies thrown by mistake from entering the fall pipe.

The size of the cess-pool is very variable; at least 22 gallons per person must be allowed, and even 33 to 44 if the refuse pipes carrying household water with fatty substances are to discharge into it, as fatty matters take a longer time to decompose than others.

It is best not to allow the rain-water pipes to discharge themselves directly into the fall pipe; the same applies also to water from wash-houses, bath-rooms, etc., which contain large quantities of liquid which hinder ferment action. When the cess-pool is completed by bacterial beds, it is better to let these pipes discharge themselves into the pipe for spreading the effluent of the cess-pool on the bacterial beds. If the cess-pool receives greasy and soapy water, it must have a capacity of 12 to 15 times more than the daily volume of liquid it receives, the latter volume being from 2 to 3 gallons per person per day.

In the case of small dwellings (containing up to 10 persons) it is economical to use reinforced concrete in the construction of cess-pools. If bacterial beds are added, they are made of porous material placed in concrete receptacles where the air can circulate freely. A surface of 1 sq. ft. and a volume of 3 ½ cub. ft. must be allowed per inmate.

The following figures give an idea of what can be effected by cess-pools combined with bacterial beds.

Untreated sewage water of the city of Paris:

Organic matter (grammes per litre)	0.46
Ammoniacal nitrogen (as ammonia)	0.015
Albuminoid nitrogen (as nitrogen)	0.005
Bacteria per cc.	415 000
Nitrates and nitrites	none

(Amongst the bacilli that of typhoid fever was found).

After passing through the cess-pool we find:

Organic matter	0.03
Ammoniacal nitrogen	0.018
Albuminoid nitrogen	0.0026
Bacteria per cc.	67 000
Nitrites and nitrates	none

(No *Bacillus coli* found).

After passing through the bacterial bed:

Organic matter	entirely decomposed
Ammoniacal nitrogen	0.0052
Albuminoid nitrogen	none
Bacteria per cc.	4 700
Nitrites (as nitrous acid)	0.004
Nitrates (as nitric acid)	0.031

(No *Bacillus coli* was found).

The importance of the action of bacterial beds in the purification of waste products is to be seen from these figures.

DE LAPPARENT, H. **Sheds for Draught Oxen.** (Les étables à bœufs de travail). — *La Vie à la Campagne*, Vol. XI, No. 135, pp. 277-278. Paris, 1$^{\text{er}}$ mai 1912. **1082**

France

In constructing a shed for draught oxen, the chief points to be considered are the following: to ensure the rest of the animals during the time they are not at work; to give them a considerable air-space; to avoid a damp, hot atmosphere, which would render the oxen delicate and liable to feel the contrast on leaving the shed; to arrange the windows and doors in such a manner that the draughts do not give cold to the animals when they return very hot from the fields; to allow of sufficient space inside and to construct the exit in such a manner that the oxen can easily move in pairs and that the ploughman can yoke and unyoke them easily in the shed.

In order to ensure the repose of the oxen, a sufficient space must be allotted to each; this can be fixed at 9 ft. to 9 ft. 9 in. width per pair in the case of large breeds like the Charolais, Garonnais and Salers. It is best not to put any division between animals which are used to work together. Between each pair, a division not reaching more than 2 ft. 6 in. away from the feeding-box and not more than 3 ft. 6 in. high, is placed. To prevent disturbing the oxen after they have finished eating and lie down to ruminate and rest, it is best to adopt the so-called *cornadis* system of feeding-box with a continuous front and provided with openings only large enough to allow of the food being pulled through them; these holes can be fitted with doors, which can be shut when the animals have finished their meal. The cowman can then clean out the feeding-boxes, and arrange the fodder for the next feed without the animals being worried. This arrangement is indispensable if the oxen are placed head to head opposite one another with a feeding passage between them, for they notice what goes on in front of them on the other side of the passage. This is one of the reasons why in two-rowed sheds it is best to place the oxen tail to tail. The space for lying down necessary for large oxen is 7 ft. 10 in. to 8 ft. 2 in.; the fall of the slope from the manger to the drainage gutter should not exceed 2 per cent. and should be as smooth as possible. The floor need not be as resistant as in the case of horses and can be made of cement 6 in. thick. For small oxen, the dimensions may be reduced; but not below 4 ft. in width and 6 ft. 6 in. in length per animal.

To allow the animals sufficient air-space, the minimum height of the roof for large oxen should be 11 feet. The windows must be low and very wide (2 ft. 6 in. by 4 ft.); the lower part, placed at a minimum height of 6 ft. 6 in. from the ground, is fitted with hinges, which allow of its being opened to different distances; the outside air thus rises to the roof where, coming in contact with the layers of the hot air of the shed, it becomes warmed before it reaches the animals.

Ventilation can be effected by means of shafts, which should be carried up beyond the roof, in order that the up draught should be regular. The shaft must be made narrower before it leaves the roof, in order to increase the up draught, and the lower portion must be provided with a regulator which can be shut right to, or partly. The section of the shafts should be a square with sides of 10 ½ in. for a shed containing 10 large oxen; but it is better to have several of smaller dimensions, say two for a building more than 20 ft. long, and three for one of more than 40 ft.

For the animals to come in and out easily, a space of 6 ft. 6 in. (5 ft. 6 in. in the case of small oxen), must be left from the drainage gutter. The entrance door, made of two parts opening outwards, should be 5 ft. wide, or more if the oxen have long and very spreading horns. The floor of the passage should not be slippery: tiles and cement, even when grooved, are thus unsuitable; small stones, more or less roughly cut, answer very well.

From the preceding data it is easy to determine the interior dimensions of the sheds. One-row sheds for large oxen should be 21 ft. wide (passage 6 ft. 6 in., drainage gutter 8 in., space for animals 8 ft., feeding-boxes 2 ft. 6 in., feeding passage 3 ft. 3 in.). With a double row head-to-head arrangement the width should be 40 ft. 6 in. (two passages 13 ft., two drains 16 in., space for two animals 16 ft., two feeding-boxes 5 ft. 3 in., one central feeding-passage 5 ft.). If, however, the oxen are arranged tail to tail in a double row, 36 ft. is sufficient (central passage 6 ft. 6 in., two drainage gutters 16 in., space for two animals 16 ft., two feeding-boxes 5 ft. 3 in., two distribution passages 6 ft. 6 in.). The length of the shed is found by multiplying 9 ft. by the number of pairs of oxen, and adding to the result a passage length of at least 2 ft. 6 in. at one end to allow the cowmen to get from the entrance passage to the feeding passage. Thus, for a shed for 10 pairs of oxen, the interior area would be 2074 sq. ft. according to the first method of arrangement; according to the second, 2147 sq. ft., and if the third were adopted, 1870 sq. ft. For small oxen, these areas could be reduced respectively to 1632 sq. ft., 1654 sq. ft. and 1472 sq. ft. The arrangement in two rows tail to tail has the advantage of requiring less space than the others. It facilitates the removal of the dung by means of a cart, since there are two sufficiently large doors at either end of the common passage.

RURAL ECONOMICS.

1088 **Characteristics of Japanese Agriculture.** (Outlines of Agriculture in Japan. Dep. of Agr. Tokyo). — *The Rhodesia Agricultural Journal*, Vol. IX, No. 4. Salisbury, Rhodesia, April 1912.

Japan

There are two features which characterise Japanese Agriculture, the first being that the principal position is assigned to the cultivation of rice, while cattle are commonly used as the animals for labour in carrying on agricultural undertakings.

The fact that agriculture is thus carried on apart from stock farming still continues without any change as in olden times, but the sericultural industry has recently made striking progress, so that it forms the principal item of agricultural undertakings throughout the country; in fact a quarter of the farmers in the country are engaged in this branch of industry.

The second feature of Japanese agriculture is the fact that it is conducted on a small scale and is intensive in its nature. According to the latest statistics obtained throughout the entire country, with the exception of Hokkaido, which is the newly opened district, it may be shown that those who are engaged in the cultivation of land to the amount of less than 1 *cho* (2.45 acres) are 70 % of the total number of farmers, while those who cultivate more than 3 *cho* (7.35 acres) of land do not exceed 3 %. It is needless to say that such a state of affairs is brought about by the large number of the population and the limited area of the fields, so that the method of cultivation needs to be intensive and the crops are commonly raised twice a year from the same farm.

According to an investigation made at the end of 1908 farmers in Japan may be divided into five classes:

1. *Jinushi* (Land owners)	0.8 %
2. *Jinushi-ken-jisaku*-farmers (Land owners combining farming) . . .	7.5 %
3. *Jisaku*-farmers (Peasant proprietors)	25.6 %
4. *Jisaku-ken-kosaku*-farmers (Peasant proprietors combining tenantship) .	38.8 %
5. *Kosaku*-farmers (Tenants)	27.3 %

From an investigation made during the same year, farmers may be classified as follows according to the amount of cultivated land in their possession and to the area of the land under their cultivation:

A. *Ratio of Agricultural Households classified according to the Area of Cultivated Land in possession.*

Under 5 tan or 1.225 acres	From 5 tan to 1 Cho; 1.225-2.450 acres	1-3 Cho 2.450-7.350 acres	3-5 Cho 7.350-12.250 acres	5-10 Cho 12.250-24.50 acres	10-50 Cho 24.50-122.50 acres	Above 50 Cho 122.50 acres
46.14 %	26.09 %	18.75 %	5.65 %	2.50 %	0.81 %	0.06 %

B. *Ratio of Agricultural Households classified according to the Area of Land under their Cultivation.*

Under 5 tan or 1.225 acres	From 5 tan to 1 Cho 1.225-2.45 acres	1-2 Cho 2.45 to 4.90 acres	2-3 Cho 4 90 to 7.350 acres	3-5 Cho 7.35 to 24.50 acres	Over 5 Cho 24.50 acres
37.26 %	32.61 %	19.62 %	6.39 %	2.98 %	1.14 %

A glance at these figures will show at once that the distribution of land under cultivation is generally made under most appropriate conditions and it will also be noted that land-owners not engaged in farming are quite few, numbering less than one per cent of the total number of farmers, and the area of land in their possession is not very large; the number of those who do not possess any land is about a quarter of the total of the agricultural households of Japan, but these favourable and satisfactory conditions are being gradually changed with general economic development of the country, so that the number of farmers who cultivate their own lands is decreasing while the number of tenants has shown a considerable increase. There is observed a tendency of large land proprietors to absorb the land owned by small farmers. While there are not exact statistics to prove the existance of such tendency, the following approximate figures were derived from an investigation covering about half the country.

Table showing the Change of Ratio between peasant proprietors and tenants.

Year	Peasant Proprietors	Peasant Proprietors combining tenantship	Tenants
1899	37 %	38 %	25 %
1903	37 %	37 %	26 %
1908	32 %	41 %	27 %

The land-owners in Japan may be regarded in most cases as capitalists pure and simple; the land in their possession is worked by tenants so that there are but few who engage themselves in farming. The land in their possession is not very large too. On the whole between the land-owners and tenants there exist favourable relations. Tenants' rents on upland fields are sometimes paid in cash but on paddy fields they are always paid in rice. It is usual that in bad years the fee is reduced more or less compared with the fixed amount. The tenant's rents are by no means very low, since the ratio of the tenant's fee to the crude proceeds is briefly 57 % in case of paddy fields and 44 % in upland fields, but the amount of land tax and other public duties payable by land-owners out of the fees collected is far from being light. According to the latest investigation the average amount of land tax and public duties throughout the entire country takes up 30-35 % of the tenant fees collected, so that actual profits obtainable by land-owners are smaller than generally expected. In reference to the farmers who cultivate their own land (peasant proprietors) it may be noted that according to the latest statistics 15-17 % of the proceeds from their farming are paid towards land taxes and other public duties; the expenses connected with cultivation, apart from labour, amount to 22-25 %, leaving the balance of 58-63 % as wages, profits and interest on capital. It is customary with peasant proprietors to utilize their leisure by engaging in some kind of subsidiary work whence they derive no small amount of profits in some districts.

1084 LAUR, ERNST. **Researches on the Profits of Farming in Switzerland for the Year 1910-1911.** (Recherches relatives à la Rentabilité de l'Agriculture suisse pour la campagne 1910-1911). — *Rapport du Secrétariat suisse des paysans au Département fédéral de l'agriculture.* I Fasc., pp. 152. Berne, 1912.

Switzerland

The report presented by the author this year, continues the researches previously begun and contains some new ones with new tables. The number of farms submitted to the control of the branch dealing with the researches on profits in farming by the Swiss peasants' Secretariat was 270 as against 276 last year. There have thus now been examined upwards of 2000 accounts. According to the author the introduction of the new Swiss Civil code, renders the extension of these researches very desirable, especially for the determination of the value of land from its returns. These values should form the basis for valuations and divisions among heirs. The realisation of this object entails a greater collection of documents in regard to geographical position and economical conditions, which requires a specially important mass of materials, and as already at present a great part of the subvention granted to the Secretariat is absorbed by researches on profits, besides the important subsidies given for this object by the Swiss peasants' union, this desideratum could not be attained without a further increase of the state subvention.

The principles of the system of book-keeping on which the enquiry on the profits of farming in Switzerland is based, contemplates a sharp separation between the circulation of cash in farming and those values that have no direct relation to farming. For this reason the total returns of the farm may be resumed from the summary of the cash book. The receipts from farming during the last 10 years were the following.

Receipts from farming.

Year	Number of accounts closed	Average per farm				Receipts per acre of area		
		Receipts			Area of property			
		£	s	d		£	s	d
1901-05	690	261	14	1.44	34.13	7	13	3.52
1906-10	1 313	281	7	5.4	32.04	8	15	3.87
1901-10	2 003	271	10	11.9	33.11	8	4	3.60
1910	270	273	6	6.9	31.09	8	15	5.39

The ratio of the receipts, taken separately to their total, is the same every year. The items concerning milk and dairy produce increase constantly every year, while cereals, vineyards, and the raising of industrial crops show every year a diminution of receipts. In 1910 for the first time an attempt was made to group the returns from the raising of stock for the butcher. The receipts from fat stock per acre of cultivated surface was £ 1 12*s*. 10.9*d*. and was made up as follows:

	per acre	
	s	*d*
Fat calves	4	3 1/2
Fat oxen	7	2 1/4
Fat cows and heifers	2	0 3/4
Store calves	2	4
Animals slaughtered in cases of urgency .	1	11 3/4
Other animals for the slaughter house .	15	0 1/2
Total	32*s* 10 3/4 *d* per acre	

The various branches of the farm contribute the following percentages to the total:

Years	Live Stock	Fields and meadows	Vineyards	Fruit growing	Forestry	Sundries	Total
1901-05	79.21	6.49	3.82	5.04	3.37	2.07	100
1906-10	81.85	5.68	3.00	6.28	2.51	0.68	100
1901-10	80.59	6.07	3.41	5.61	2.94	1.38	100

The extent of the estates does not exert any special influence on the principal sources of income. Only vineyards give, for a series of years, an average varying with the extent cultivated.

As for the expenses in cash, the smaller the farm the greater the expenses per acre. The following are the working expenses per acre, divided into groups.

	Year 1910			Average 1901-10		
Number of accounts closed	270			1943		
Expenses per acre	£	*s*	*d*	£	*s*	*d*
Salaries		14	9		12	10
Live Stock	2	11	1	2	2	1
Manures		4	9 3/4		4	6
Concentrateds		18	1		12	8
Other Fodder		5	0 3/4		4	8 1/4
Seeds		1	6 1/4		1	3
Taxes payable by estate		4	3 3/4		3	10½
Insurance		2	4 3/4		1	11 3/4
Dead Stock		7	3½		6	4
Straw and Litter		2	—		1	8
Accounts and Salaries of artisans		5	11		5	6
Sundries for Live-Stock		2	0½		1	9½
Veterinary and medicines			10 3/4			9½
Miscellaneous articles in inventary			11		1	6½
Transport			11 1/4			7
Vineyards			5 3/4			5
Sundries		4	11 1/4		4	0¼

The greater expenses for live stock are chiefly due to the rise in the prices of animals.

With the exception of the large properties and of the large peasants' farms, everywhere in 1910 an increase in the labour bil of about 1*s* 7 ¼*d* per acre has been noticed. It is presumed that this is due to the greater cost of living. The comparison between the two quinquennial periods 1901-1905 and 1906-1910 shows for the latter a great general increase.

This increase attained :

	per acre		%
Small farms	10*s*.	0 ½*d*	7.59
Small peasants' farms	7	10	7.80
Peasants' farms	7	7 3/4	9.81
Large peasants' farms	8	7 3/4	13.03
» » »	6	7 3/4	12.80
Average of all the accounts examined	10	0 ¼	11.40

The greater the farm, the greater the increase in the labour bill caused by the increased wages. The proportion between salaried labour and that performed by the members of the families is here given :

	Average 1901-1910			Average 1910		
	Number of farms	Salaried labour %	Labour by members of families %	Number of farms	Salaried labour %	Labour by members of families %
Small farms up to 12.3 acres	228	9.80	90.20	37	7.42	92.58
Small peasants' farms 12.3 to 24.7 ac. . .	767	19.75	80.25	110	19.42	80.58
Peasant farms 24.7 to 37 ac.	476	28.80	71.20	61	30.15	69.85
Large peasant farms 37 to 74 ac. . . .	393	46.20	53.80	41	47.50	52.50
Large farms upwards of 74 acres	106	61.25	38.75	17	57.30	42.70
Average of all the accounts examined .	1970	33.55	66.45	266	31.70	68.30

With the exception of the peasants' farms and the large peasants' farms an increase in the value of the work of the members of the families is everywhere noticeable.

The cost prices of a day's work of the hired labourers and of the members of the families were :

	Hired labourers	Members of the families
Average 1910 . . .	2*s*. 3.87*d*.	2*s*. 8.92*d*.
Average 1901-1910 .	2*s*. 0.26*d*.	2*s*. 4.17*d*.

Those farms which besides the members of the families employ only day labourers, show the highest cost of labour; next come those with servants (2*s.* 10.06*d* per day's work) then, those with young servants, boarders etc. and one or two servants (2*s.* 0.55*d.* per day's work); and lastly those with young servants, boarders etc. and no adult servants, pay the lowest daily wages (1*s* 6.84 *d.*).

Admitting the indemnity of management allowed to the head of the farm to be about 0.5 % of the capital, and on average about 4.47*d.* per day, and deducting this share, the cost of a day's work of the members of the family amounts to about 2*s.* 4.55*d.*

The number of days' work per acre is the following:

	Number of farms	Day's work per acre of salaried labour	members of family	Total
Average 1910 . . .	266	12.14	21.85	34.00
Average 1901-1910 . .	1970	12.95	22.25	35.20

With the exception of 1902, the year examined in this report shows the lowest number of days' work. This seems to be the explanation of the greater cost of the work day.

Table I gives the working expenses for 1 acre of area cultivated and for 100 shillings of gross yield.

TABLE I. *Working Expenses.*

	Small farms		Small peasants' farms		Peasants' farms	
Years	1910	1908-1910	1910	1908-1910	1910	1908-1910
Number of accounts closed	38	106	110	339	61	186

Per acre of cultivated area,

	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Amortisement .	19 0	15 2¾	12 5¼	12 10¾	13 9¼	11 3¼
Diminution of unexhausted manures, etc. .	0.65	2.04	6.08	6.08	1.85	1.73
Diminution of provisions . .	7 4¼	6 9	5 5¼	5 0	6 0¾	5 4¾
Working expenses	3-11-6	2-19-8¼	2-10-8¾	2-9-6¼	2-9-5¼	2-6-1½
Banking . . .	3.50	1.77	0.58	0.89	2.46	2
Interest on capital	5-1-2½	4-18-1 ¾	3-13-10¾	3-13-1¾	3-9-11¾	3-9-3½
Labour expenses	8-0-9¾	7-9-9½	5-12-4¼	5-10-9	3-9-11¾	3-9-1½
Total. . .	18-0-2¾	16-9-11	12-15-4¾	12-11-10¾	10-9-7	10-1-6¼

Per 100 *shillings of gross returns.*

	s	*s*	*s*	*s*	*s*	*s*
Amortisement .	6.56	5.63	4.98	5.27	5.77	5.79
Diminution of unexhausted manures, etc. .	0.02	0.06	0.20	0.21	0.07	0.07
Diminution of provisions . .	2.54	2.50	2.18	2.04	2.59	2.48
Working expenses	24.70	22.06	20.20	20.26	21.16	21.23
Banking . . .	0.10	0.05	0.02	0.03	0.09	0.07
Interest on capital	34.96	36.28	29.62	29.92	29.95	31.83
Labour expenses	55.57	55.37	45.02	45.17	39.75	41.48
Total . . .	124.45	121.95	102.22	102.90	99.38	102.95

Expenses per acre of cultivated area.

	Large peasants' Farms		Large Farms —		General Average —	
Years	1910	1908-10	1910	1908-10	1910	1908-10
Number of accounts closed	42	147	19	55	270	833
	£ *s d*	£ *s d*	£ *s d*	£ *s d*	£ *s d*	£ *s d*
Amortisements . .	7-11 ¾	9-5 ¼	6-4	8-0	12-5 ¾	12-0 ½
Diminution of unexhausted manures, etc.	3.20	4.93	1.58	4.16	3.62	4.27
Diminution of provisions	6-6 ½	4-4	4-10 ½	4-7 ¾	5-11¾	5-0 ¾
Working expenses .	2-4-4 ¼	2-6-0¾	2-3-6 ½	2-8-6 ¼	2-11-8 ¾	2-9-6
Banking	2.16	1.00	1.54	1.31	1.73	1.31
Interest on capital .	3-2-3	3-3-6	2-5-7 ¼	2-6-3 ¾	3-13-0 ½	3-11-5 ¾
Labour expenses . .	3-16-8	3-16-9¾	2-17-9 ½	3-2-4 ¼	5-5-4 ½	5-11-1 ¾
Total . . .	9-18-3	10-0-7¾	7-18-4 ¾	8-10-3 ½	12-9-0 ½	12-0-6 ¼

Per 100 shillings of gross returns.

	s	*s*	*s*	*s*	*s*	*s*
Amortisements. . .	0.07	4.94	3.93	4.76	5.26	5.27
Diminution of unexhausted manures, etc.	0.14	0.20	0.08	0.21	0.13	0.16
Diminution of provisions	3.35	2.19	3.03	2.76	2.52	2.21
Working expenses .	22.66	23.29	27.09	28.81	21.83	21.66
Banking	0.09	0.04	0.06	0.06	0.06	0.05
Interest on capital .	31.80	32.10	28.36	27.50	30.83	31.27
Labour expenses . .	39.16	38.84	35.95	37.02	44.47	44.61
Total . . .	101.27	101.60	98.50	101.12	105.10	105.23

With the exception of peasants' farms and of large farms the total working expenses including interest on capital in 1910 exceed everywhere £1.12*s*. per acre and are higher than the gross receipts. The full payment of the interest (4 %) on the capital has in hardly any case been possible.

In the actual conditions of the money market, an average interest of 4½ % might be demanded. The ratio between gross receipts and expenses would be still more disadvantageous.

About one half of the gross receipts are absorbed by the labour bill. The other working expenses utilize about the fifth part.

The valuation of the interest at 4 % corresponds amply to 3/10 of the gross receipts; the rest is divided among the other subdivisions.

In order to calculate the housekeeping expenses, the total expenses of living have been calculated on the basis of the daily cost of living for a grown-up man (a grown-up man = 1; a woman 0.8 and children from 0.3 to 0.8). Besides the expenses in cash and in kind, account has also been kept of the interest on the capital of the household; rent of the kitchen, of the living room and an indemnity for the members of the family working in the housekeeping without being paid for it. Housekeeping expenses show for 1910 a new increase amounting to 0.38*d* per day; the average annual expense for 1910 is 1*s* 2.73*d* per day. The consumption in kind for the farm housekeeping in 1910 is the following per man:

Potatoes	—	15	0
Fruit and fruit-products .	1	6	0
Vineyard products	—	5	7½
Flour	—	17	6½
Poultry, etc.	—	3	4
Forest products	—	16	10
Field pulse	—	2	3
Bee products	—	—	10½
Meat	1	16	0
Milk and milk products . .	3	6	7
Kitchen garden	—	2	10½
Eggs	—	—	4¾
Waggoner's work	—	—	2
Various	—	3	2¼

The gross returns in 1910 show per acre with the forests, an increase of 9*s* 5.21*d* (that is to say £11.16*s* 11.5*d*). It is particularly heavy for the three smallest classes, while the large farms and large peasants' farms show smaller returns. The returns increase in inverse proportion to the size of the farms. The following are the figures for the average of the ten years:

	Gross returns per acre, without forests in % of those of the large farms. —	Working expenses, in % of those of the large farms. —
Small farms up to 12.3 acres	153.20 %	211.25 %
» peasants' farms 12.3 to 24.7 ac.	133.80 »	163.45 »
Peasants' farms 24.7 to 37 ac.	117.40 »	135.65 »
Large peasants' farms 37 to 74 ac. . .	110.— »	124.50 »
Large farms upwards of 74 ac.	100.— »	100.— »

These figures show that if small farms show relatively higher gross returns, this apparent superiority is more than balanced by the increase of their working expenses; the result is lower yields for the small farms.

Table II shows the gross revenue per acre on the amplified system of book-keeping, so as to give the reader an exact idea of the analytical value of this system.

Examination of the net returns per acre of the farms including the forest land shows: The net income represents the interest of the capital engaged in the farm. It is on the net income that the profitableness of the farm can be determined. The relative figures for which the areas, the gross returns or the working expenses offer the means of comparison present a great interest. The results of the net income may be examined under different aspects. The following table gives the net income in percentage of the capital and per acre of cultivated land with the forest land.

	Small farms —	Small peasants' farms	Peasants' farms —	Large peasants' farms	Large farms —	Average
Number of farms	38	110	61	42	19	270
Year 1910. . . .	131 %	3.70 %	4.02 %	3.83 %	4.02 %	3.71 %
» » per ac.						
Number of farms	230	772	476	404	115	1997
Average 1901-1910	2.26 %	3.04 %	3.30 %	3.46 %	4.30 %	3.39 %
Average 1901-1910 per acre . . .	£2-6*s* 6*d*	£2-16*s* 7*d*	£2-13*s* 6¼*d*	£2-13*s* 10½*d*	£2-6*s* 6*d*	£2-13*s*. 2*d*.

Contrary to general expectations, the year 1910, which was believed, on account of the predominant bad weather, would have been one of the worst for the agriculture of Switzerland, shows an

TABLE II.

Gross returns per acre according to the amplified system of book-keeping, and distribution in percentages of the gross returns for the agricultural year 1910.

Size of farms	Small farms		Small peasants' farms		Peasants' farms		Large peasants' farms		Large farms		Total of farms	
Number of farms:	38		110		61		42		19		270	
1. *Increase of Inventary.*	*s d*	%	*s d*	%	*s d*	%	*s d*	%	*s d*	%	*s d*	%
Unexhausted manures, etc.	6.39	0.20	9.59	0.32	3.50	0.12	4.16	0.18	2.54	0.13	6.43	0.23
Hay and aftermath	7-3.30	2.50	5-2.34	2.08	5-4.00	2.28	3-3.05	1.70	4-0.86	2.53	5-1.65	2.17
Straw and litter	9.39	0.27	10.90	0.36	4.85	0.17	5.35	0.23	4.04	0.21	7.97	0.28
Potatoes	7.05	0.20	7.08	0.24	3.50	0.13	3.62	0.15	2.16	0.11	5.39	0.19
Roots and tubers (for stock).	1.39	0.04	1.81	0.06	1.00	0.04	0.15	0.01	0.31	0.02	1.19	0.04
Other crops	0.46	0.01	0.81	0.03	0.15	0.01	1.43	0.06	0.04	—	0.65	0.02
Cereals	1-0.78	0.37	4.08	0.14	4.60	0.16	8.70	0.32	7.24	0.38	6.35	0.22
Farmyard manure	—	—	—	—	—	—	—	—	—	—	—	—
Other provisions	1-8.91	0.60	10.70	0.35	2.62	0.09	6.01	0.26	2.97	0.15	9.05	0.32
Total: increase of inventary	***12-1.68***	***4.19***	***8-11.32***	***3.58***	***7-0.17***	***3.00***	***5-8.46***	***2.91***	***5-8.16***	***3.53***	***8-2.70***	***3.47***
2. *Gross Produce*												
Sale and delivery of cereals	6-9.52	2.35	6-0.78	2.43	4-9.57	2.05	5-8.00	2.89	3-3.77	2.06	5-7.50	2.37
„ of straw	5.97	0.17	9.51	0.32	6.12	0.22	10.59	0.45	1.23	0.07	7.82	0.27
„ of potatoes	7-5.42	2.57	5-6.89	2.23	4-5.37	1.90	3-11.60	2.03	2-5.88	1.55	5-1.42	2.16
„ of other roots and tubers.	6.62	0.19	3.89	0.13	1.39	0.05	0.58	0.02	0.85	0.04	2.97	0.10
„ of other crops	1-7.71	0.57	2-2.68	0.89	1-6.37	0.66	4.70	0.20	7.74	0.40	1-7.06	0.67
„ of hay	2-1.03	0.72	2-10.85	1.16	1-9.18	0.76	1-7.40	0.83	3-0.51	1.89	2-4.12	1.00
„ of litter	—	—	5.47	0.18	0.92	0.03	0.54	0.02	2.20	0.11	2.66	0.09

	s d	%	*s d*	%	*s d*	%	*s d*	%	*s d*	%	*s d*	%
Fruits and cider	19-6.31	6.75	26-6.65	10.65	25-3.56	10.83	11-2.08	5.72	11-2.28	6.96	21-9.70	9.20
Wood, increase	1-11.37	0.67	2-1.87	0.86	2-0.02	0.86	1-6.90	0.80	4.43	0.23	1-10.52	0.79
Gross produce of vineyards	5-8.27	1.97	4-1.91	1.67	4-8.57	2.02	1-1.63	0.58	1.46	0.08	3-8.94	1.58
„ „ of forest	4-2.10	1.44	5-10.39	2.35	7-6.03	3.20	8-4.62	4.28	6-7.95	4.14	6-5.37	2.72
Produce from cattle:												
Increase (without fattened calves)	53-1.04	18.34	40-11.59	16.42	33-5.91	14.33	30-4.13	15.50	25-4.29	15.78	38-2.87	16.15
Milk and dairy produce	96-1.24	33.20	89-5.37	35.85	99-7.87	42.65	87-1.84	44.52	75-9.56	47.15	91-4.48	38.56
Fattened calves	13-11.20	4.81	6-8.64	2.69	2-10.97	1.25	2-8.31	1.38	1-10.25	1.15	5-10.93	2.49
Carting and sundries	2-0.33	0.70	2-0.49	0.82	3-3.86	1.42	2-5.27	1.25	2-7.04	1.62	2-5.12	1.02
Gross returns from stables (Horses):												
Breeding and sundries	2-7.73	0.91	9.66	0.32	5.85	0.21	1-5.71	0.75	1-10.91	1.19	1-2.09	0.50
Carting	10.86	0.31	4-4.06	1.75	4-0.44	1.73	3-3.16	1.67	2-0.91	1.29	3-5.51	1.46
Gross returns from pigsties	24-8.51	8.54	17-10.18	7.15	14-5.09	6.17	16-3.54	8.32	12-5.30	7.75	17-5.02	7.35
Gross returns from goats	5.51	0.16	1.31	0.04	0.81	0.03	4.16	0.18	0.65	0.03	2.16	0.08
Gross returns from the sheep fold	1-5.25	0.50	4.77	0.16	4.50	0.16	4.81	0.20	0.81	0.04	6.20	0.22
Gross returns from apiary	4-5.37	1.54	1-2.75	0.62	9.20	0.33	6.47	0.28	0.92	0.05	1-6.25	0.64
Rental of buildings	22-0.20	7.62	14-4.36	5.88	11-4.78	4.88	8-5.55	4.32	3-4.47	2.10	13-2.57	5.58
Rental of small plots	7.01	0.20	6.97	0.23	5.62	0.20	5.39	0.23	1.77	0.09	6.05	0.21
Prestations in labour for the improvement and increase of capital in buildings and in dead stock	10.97	0.31	1-6.87	0.63	1-0.78	0.46	4.70	0.20	1.62	0.08	1-0.98	0.46
Interest of reserve capital	—	—	2.97	0.10	1.62	0.06	1.08	0.05	1.23	0.06	1.81	0.06
Other items of income	3-3.58	1.14	2-0.00	0.80	11.28	0.40	7.82	0.33	10.70	0.55	1-7.87	0.70
Total: gross produce	*276-11.54*	*95.68*	*240-4.74*	*96.33*	*226-3.72*	*96.86*	*189-10.58*	*97.00*	*155-0.89*	*96.46*	*228-5.95*	*96.43*
3. *Bank account current*	4.35	0.13	2.70	0.09	3.85	0.14	5.89	0.09	4.39	0.01	6.78	0.11
Total gross produce	*289-5.56*	*100*	*249-6.76*	*100*	*233-7.76*	*100*	*195-9.09*	*100*	*160-9.20*	*100*	*236-11.57*	*100*

TABLE III.

Influence of the kind of farm on results (Average 1904-1910).

Types of production		Dairy Farms	Breeding Farms	Live-stock Dealers' Farms	Fattening Farms	General Farms	Arable Farms	Farms for cartage animals	Fruit Farms	Vineyard Farms	Forest Farms	Other Farms
—		—	—	—	—	—	—	—	—	—	—	—
Number of accounts closed.		899	185	41	306	254	3	2	43	37	2	16
Climatic conditions, points.		3.7	2.7	3.4	3.7	3.6	4.0	4.0	4.8	3.9	2.7	3.3
Markets for produce, points		3.6	2.5	3.2	3.3	3.5	5.0	3.8	4.4	3.8	3.0	3.0
Quality of soil, points		3.9	3.6	3.7	3.8	3.7	4.0	4.0	4.5	4.1	4.0	3.5
Forests in % of total area		12.11	6.05	11.48	12.32	12.15	—	8.14	18.83	7.24	49.75	8.66
Area of farms, acres.		37.56	28.17	32.47	22.23	24.59	14.60	17.35	25.49	27.80	180.94	22.51
		£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Capital in livestock per acre (excluding forest land)		9-19-7	8-14-4	9-18-8	9-2-1	8-4-8	4-7-7	12-5-2	11-1-11	5-16-3	4-10-3	4-15-1
Capital in fruit trees (excluding forest land)		5-12-9	1-8-2	5-4-5	5-18-7	5-14-7	4-3-2	6-19-11	20-0-10	5-2-0	6-19-4	3-18-6
Outlay in cash	Purchase of live stock per acre, (excluding forest)	2-1-11	1-12-9	8-1-10	2-16-10	1-10-5	15-4	5-1-4	3-4-9	1-10-9	17-3	17-10
	Concentrated foods per acre (excluding forest)	17-10	5-10	9-1	11-7	10-8	4-7	10-0	1-4-3	7-2	4-7	5-7
	Artificials per acre (excluding forests)	5-2	1-2	3-7	4-2	4-6	11-11	7-7	7-4	9-6	1-10	3-6
Expenses for labour per acre		4-11-3	4-8-1	4-9-10	5-4-1	5-2-10	7-6-10	6-11-8	6-4-5	7-8-5	2-1-5	4-10-4
Other working expenses per acre		2-19-9	1-14-8	2-18-8	2-9-3	2-12-6	3-8-0	6-6-0	4-0-9	3-5-0	6-10	1-8-4

Total working expenses per acre		£ s d 7-11-0	£ s d 6-2-9	£ s d 7-8-6	£ s d 7-13-4	£ s d 7-15-5	£ s d 10-14-11	£ s d 12-17-8	£ s d 10-5-2	£ s d 10-13-5	£ s d 2-8-5	£ s d 5-18-8
Housekeeping expenses per day		d 5.47	d 5.08	d 5.39	d 4.97	d 4.97	d 4.31	d 6.62	d 5 62	d 5.62	d 4.58	d 5.01
Price of milk per gallon		7.04	7.55	7.93	7.13	7.28	6.98	7.14	6.94	7.33	6.27	7.41
Percentage of receipts	from the pigsties . . . . %	% 7.74	% 5.93	% 6.35	% 8.22	% 9.54	% —	% 2.97	% 3.50	% 1.44	% 6.60	% 8.80
	from breeding stock . . . %	9.43	47.71	42.47	7.15	13.28	—	6.33	9.61	9.55	18.84	12.61
	from fattened stock . . . %	13.78	10.57	17.81	49.75	18.28	8.50	11.14	9.16	10.55	7.96	14.34
	from milk . %	48.12	16.14	19.28	12.80	20.43	18.74	15.45	42.72	16.21	0.23	9.23
Gross returns	from live stock per acre, (excluding forest) .	£ s d 8-18-00	£ s d 6-6-9	£ s d 8-0-6	£ s d 7-8-6	£ s d 6-15-0	£ s d 3-14-10	£ s d 14-15-2	£ s d 11-5-00	£ s d 4-15-5	£ s d 1-18-9	£ s d 4-8-4
	from fruit trees per acre (excluding forest) . .	1-2-9	4-10	1-3-0	1-6-3	1-4-9	1-12-6	1-14-11	6-11-10	17-4	3-00	6-11
	from vineyards per acre of vineyard	3-15-11	1-18-5	2-6-1	7-13-8	14-10-5	8-13-1	32-16-7	3-6-0	41-10-11	—	10-4-2
Total gross returns per acre (excluding forest)		12-1-1	8-6-5	11-16-2	10-18-9	11-14-3	16-15-7	20-15-3	19-6-8	17-10-1	5-10-1	8-8-2
Net returns	per acre	3-4-7	1-12-6	2-19-5	2-4-6	2-9-5	6-0-5	7-10-8	7-1-4	6-0-6	14-7	1-16-2
	per 100 shillings of working expenses	% 42.78	% 26.50	% 40.00	% 29.02	% 31.79	% 56.19	% 58.47	% 68.89	% 56.48	% 30.15	% 30.42
	in % of the capital (absolute mean)	3.71	2.55	2.94	2.91	3.02	7.16	4.64	5.09	3.91	2.81	1.94
Economic revenue per acre		£ s d 7-14-7	£ s d 4-10-2	£ s d 7-11-0	£ s d 7-9-10	£ s d 7-16-6	£ s d 12-7-10	£ s d 13-9-6	£ s d 13-4-8	£ s d 13-5-10	£ s d 5-4-8	£ s d 6-9-9
Inventary value of property, per acre .		71-7-0	53-7-7	78-15-9	67-5-0	71-19-0	71-3-9	114-0-8	110-8-2	123-17-5	27-19-2	69-17-11
Value obtained by capitalizing the revenue		62-16-1	28-17-1	54-9-2	39-2-1	45-10-8	137-15-7	140-0-4	153-10-10	107-5-2	13-13-7	35-7-1

increase over 1909. With the exception of small farms all classes show this greater value. The explanation is to be found in the results obtained by the system of amplified book-keeping applied to the gross income and working expenses.

The weak point of small farms seems to be the subdivision of their land. The differences between the various degrees of subdivision are striking. The expenses for labour of the most subdivided group were 128 % of those of the group most favourably situated in this respect, whilst the gross revenue does not exceed 79 %. The net returns are thus doubly lowered by the increase of subdivision. Since the group of small farms is for about two thirds composed of those in which the subdivision of land is average or unfavourable, the result is strongly influenced by this circumstance.

As for the influence of the system of cropping the land upon results, grass crops seem in 1910 to have been particularly favoured, whilst the other crops show less favourable results. The causes of the advantageous results attending grass crops are the following :

1. The favourable composition of this class of farms.

2. The working up of the milk production being predominant, it has been possible to take advantage of the increased price of milk without causing a noticeable increase in the expenses; on the other hand in farms based on the three years' rotation, the multiplicity of the different branches of farming joined to a considerable increase of expenses prevented full profit being drawn from the high price of milk.

3. The exceptional moisture of 1910 seems also to have been more injurious to farms under other crops than to those under grass. The former show a notable increase in the purchase of concentrated foods.

Table III gives, in figures, the relation between the results and the different types of production and of farming. The results of 1910 are comprised within average figures so that they represent now an average of 7 years. Here also it is necessary to analyse the sub-groups, particularly in regard to those farms which fatten stock, because it is in those farms which fatten calves that results have changed in the most favourable manner, that is to say with an increase of net revenue of £1 6*s* 7.61*d* per acre over the average of 1904-1910 which was £3 10*s* 0.24*d* per ac. This is equivalent to a net yield of 6.19 % against 4.48 % and to a capital (worked out from net returns) of £101 19*s* 7.6*d* per acre as against £67 12*s* 7.08*d* in 1904-1910.

Farms fattening oxen are also progressing, that is to say with a net revenue of £2 4*s* 11*d* per acre in 1910 aigainst £1 10*s* 7*d* in 1904-1910; 2.52 % against 2.22 % with a capital calculated from the net revenue of £42 7*s* 9.78*d* against £23 3*s* 8.39*d*.

For 12 farms exclusively milk-producing the figures for 1910 are the following:

	£	*s*	*d*
Labour expenses per acre	5	5	11¼
Total working expenses per acre	9	12	9½
Gross returns per ac.	14	12	1½
» » from live stock without forests, per ac.	13	10	9¾
Net revenue per ac.	4	19	3¾
» » in % 6.15			
Capital value per acre (calculated by capitalising the net income)	137	16	6¼

The increase of the net returns in % on the average 1904-1910 is 0.30 %.

In conclusion a more or less important progress in comparison with the general average is visible in almost all the classes examined, the best results being furnished by those farms which fattened calves; while those which fattened other cattle and the small farms show a somewhat regressive tendency.

The author concludes that the results of this enquiry point to the advisability of examining with prudence the question as to the extension of the fattening industry.

Breeding farms in 1910 gave satisfactory results, but one can not yet affirm that it is advantageous in the flat lands to replace fattening by a more intensively conducted breeding. The superiority of milk farms is unquestioned, but it appears that in those regions in which one-sided milk farming cannot be carried out, more attention might be devoted to the question of breeding. It would be desirable that a greater number of farms situated in the plains should be submitted to the book-keeping control of the Secretariat in order to investigate more closely this important question.

1085 HAYS, W. M., BOSS, A., WILSON, A. D., and COOPER, T. **Farm Management Investigations in the United States.** — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 236. Washington, April 15, 1912,

United States

The cultivated area of the farms of the United States is approximately 500 000 000 acres and the value of the crop from this cultivated area is about $5 000 000 000 (nearly £1 000 000 000). Work already done by the State Experiment Stations and the General Government has shown that by better methods of crop rotation alone this product can be increased easily 10 % or $500 000 000 or $1 per acre.

But in studying the question of farm management it early became evident that actual cost data would be necessary in determining the profits of any scheme of farm production. To collect this cost data the Bureau of Statistics of the United States Department of Agriculture in 1902 joined in cooperation with the Division of Agriculture of the Minnesota Agricultural Experiment Station to secure from Minnesota farmers through route statisticians the facts relative to the cost of producing field and live-stock products. Subsequently the Office of Farm Management in the Department of Agriculture developed a somewhat different system, in which the farmer himself keeps a daily record of time of men and horses spent on each enterprise, a record of yields, cash expenditures, and other items, and reports periodically to the central office on forms supplied to him. These two methods are being compared, and it is evident that, besides being checks upon each other, each is better adapted to certain conditions, so that a combination of the two plans will best secure the desired results.

By combining the two methods of investigation plans have been developed under which general data of the cost of farm products should be secured in each and every State at the earliest practicable date.

To use these data, the farmer needs to organize his farm somewhat systematically and to have a knowledge of simplified forms of recording the results of his farm products in terms of money. He should correct the published figures so as to make them applicable to his conditions and products in such a manner as to enable him to determine net profits. He will then be able to compare the net profits of each kind of crop, of each system of rotation, and of each general method of farm management on his own farm, on the farms in the vicinity, and on farms in other localities.

The following tables, based on Bureau of Statistics Bulletin No. 73 give some of the facts secured by these investigations.

Average annual cost per acre of producing field crops in Minnesota (1902-1907), including rent.

Crop	Northfield (Rice County)				Marshall (Lyon County)				Halstad (Normann County)			
—	$	£	s	d	$	£	s	d	$	£	s	d
Barley, fall plowed . . .	9.65	1	19	8	8.88	1	16	6	7.00	1	8	9
Clover, cut for seed . . .	6.50	1	6	9	—	—			—	—		
Corn (maize), ears husked from standing stalks .	11.66	2	5	6	9.66	1	19	9	—	—		
Corn (maize), cut, shocked and hauled in from field	15.30	3	2	11	10.27	2	2	2	—	—		
Corn (maize), grown thickly and siloed	20.63	4	4	10	—	—			—	—		
Flax seed, thrashed from windrow	10.07	2	1	5	—	—			7.27	1	9	10
Flax seed, stacked from windrow	—	—			8.86	1	16	5	7.03	1	8	9
Flax seed, bound, shocked, stacked and thrashed	—	—			8.40	1	14	6	6.90	1	8	4
Fodder corn (maize), cut and shocked in field .	10.73	2	4	2	—	—			8.91	1	16	8
Fodder corn (maize), cut shocked and stacked .	12.36	2	10	10	—	—			—	—		
Hay (timothy and clover), first crop	6.19	1	5	6	5.55	1	2	10	4.57		18	9
Hay (timothy and clover), two cuttings	7.18	1	9	6	—	—			—	—		
Hay, (millet)	9.32	1	18	4	7.97	1	12	9	6.35	1	6	1
« (wild grasses) . . .	6.04	1	4	10	5.48	1	2	6	2.97		12	3
Hemp	6.74	1	7	8	—	—			—	—		
Oats, fall plowed	9.85	2	0	6	9.04	1	17	2	7.11	1	9	3
» on disked corn stubble	9.16	1	17	7	8.09	1	13	3	—	—		
Timothy, cut for seed . .	5.99	1	4	7	5.51	1	2	8	4.31		17	9
Wheat, fall plowed . . .	9.86	2	0	6	8.39	1	14	6	6.98	1	8	8

At the Minnesota Agricultural Experiment Station, the two following figures were obtained :

Corn, grown thickly and siloed. .	$19.19 (£3 18 10)
Mangels	$32.68 (£6 14 3)

Cost of labor operations per acre in Minnesota.

Crop	Northfield			Marshall			Halstad		
—	$	*s*	*d*	$	*s*	*d*	$	*s*	*d*
Grain:									
Plowing, fall . .	1.26	5	2	1.14	4	8	1.13	4	8
Plowing, spring	1.31	5	5	1.17	4	10	1.19	4	11
Cleaning . . .	0.023	—	1	0.035	—	1¾	0.03	—	1½
Dragging . . .	0.24	1	0	0.17	—	8½	0.28	1	2
Seeding	0.37	1	6	0.24	1	0	0.27	1	2
Cutting	0.46	1	11	0.33	1	5	0.33	1	5
Shocking . . .	0.22	—	11	0.11	—	5½	0.14	—	7
Stacking . . .	0.79	3	3	0.54	2	3	0.48	2	0
Thrashing . . .	0.53	2	2	0.26	1	1	0.31	1	4
Hay:									
Mowing	0.37	1	6	0.33	1	5	0.36	1	6
Raking	0.18	—	9	0.21	—	10½	0.25	1	0
Hauling in . .	1.10	4	6	1.24	5	1	1.27	5	3
Corn (maize):									
Shelling seed .	0.026	—	1¼	0.025	—	1¼			
Plowing	1.31	5	5	1.17	4	10			
Dragging . . .	0.54	2	3	0.44	1	10			
Planting . . .	0.24	1	0	0.26	1	1			
Cultivating . .	1.81	7	5	1.45	6	0			
Husking . . .	3.46	14	2	2.47	10	2			

In this Bulletin an attempt is made to give some of the formal methods needed by the farmer in utilizing the results of rotation experiments and of these investigations, as well as data as to yields and values secured in his own fields and barns; that in a simplified way he may be able to compare the relative profits of his crops, his rotation schemes, his methods of live-stock production, and his general methods of farm management, both within his own farm and with other farms. The effort is also made to offer a pedagogical plan under which the teacher in the college of agriculture may be able both to teach the general principles of farm management and to give the pupils skill in making comparisons and efficiency studies in relation to farm methods and practices.

1086 **Wages of Farm Laborers in the United States.** — *The Country Gentleman*. Philadelphia, April 20, 1912.

United States

The average wages of farm labor in the United States for a number of years are shown in a Government Report, which gives the wage by the month and by the day during harvesting and at other times (in dollars).

Year	Monthly wage		Daily wage at harvest		Daily wage at other times	
—	Without board	With board	Without board	With board	Without board	With board
1911 . . .	28.77	20.18	1.85	1.49	1.42	1.09
1910 . . .	27.50	19.21	1.82	1.45	1.38	1.06
1902 . . .	22.14	16.40	1.53	1.34	1.13	0.89
1899 . . .	20.23	14.07	1.37	1.12	1.01	0.77
1898 . . .	19.38	13.43	1.30	1.05	0.96	0.72
1895 . . .	17.69	12.02	1.14	0.92	0.81	0.62
1894 . . .	17.74	12.16	1.13	0.93	0.81	0.63
1893 . . .	19.10	13.29	1.24	1.03	0.89	0.69
1892 . . .	18.60	12.54	1.30	1.02	0.92	0.67
1890 . . .	18.33	12.45	1.30	1.02	0.92	0.68
1888 . . .	18.24	12.36	1.31	1.02	0.92	0.67
1885 . . .	17.97	12.34	1.40	1.10	0.91	0.67
1882 . . .	18.94	12.41	1.48	1.15	0.93	0.67
1879 . . .	16.42	10.43	1.30	1.00	0.81	0.59
1875 . . .	19.87	12.72	1.70	1.35	1,08	0.78
1869 . . .	25.92	16.55	2.20	1.74	1.41	1.02
1866 . . .	26.87	17.45	2.20	1.74	1.49	1.08

1087 **Dairying v. Wheat-Growing in Queensland.** — *Queensland Agricultural Journal*, Vol. XXVIII, Part 4. Brisbane, April 1912.

Australia: Queensland

The following very interesting comparison of costs and profits in connection with wheat and maize farming and dairying and mixed-farming was published early in March in the *Brisbane Courier* and is now reproduced in the Queensland Agricultural Journal. For many years wheat and maize were the leading crops of that part of the Darling Downs which has Warwick for its centre. The soil generally is very rich, the climate almost perfect, and the rainfall good. In recent years wheat has become a diminishing factor, and dairying has increased rapidly. The reason of this is the very practical one of costs and returns. One of the very ablest wheat-growers in Queensland has given up cereals for the cream-can, and he gives the following figures of costs and returns. He has prepared them carefully and reasonably from the practical man's standpoint, and as he found them under practical conditions. The figures set forth are as follows:

Wheat and Maize Farming.

	£	s.	d.	£.	s.	d.
Wheat:						
400 acres at £10 per acre				4000		
Ploughing 200 acres at 8*s* per acre	80	0	0			
Cultivating 200 acres at 4*s* per acre	40	0	0			
Harrowing 200 acres at 2*s* 6*d* per acre	25	0	0			
Drilling in seed at 3*s* per acre	30	0	0			
Wheat, 200 bushels graded seed at 4*s* per bushel	40	0	0			
Harvesting 200 acres at 8*s* per acre	80	0	0			
1067 sacks at 6*d*.	26	13	6			
Carting the 1067 sacks to railway station 4 miles 6*d*.	26	13	6			
				348	7	0
Maize for grain:						
150 acres maize ploughing at 8*s*. per acre . . .	60	0	0			
150 acres second ploughing at 5*s*. per acre . . .	37	10	0			
Cultivating 150 acres at 3*s*. per acre	30	0	0			
150 acres harrowing at 2*s*. 6*d*. per acre	18	15	0			
Scuffling 150 acres twice at 4*s*. per acre	30	0	0			
Pulling or stacking 150 acres maize at 7*s*. per acre	52	10	0			
2000 sacks at 6*d*.	50	0	0			
Carting to railway 2000 sacks at 4 miles at 6 *d*. .	50	0	0			
Thrashing 2000 bags at 6*d*.	50	0	0			
				378	15	0
				4727	2	0
Interest at 5 % . .				236	7	0
Total . . .				4963	9	0
Proceeds: 200 acres wheat, 16 bushels, per acre: 3200 bushels, at 3*s*.				480	0	0
Proceeds on 150 acres maize, 40 bushels: 6000 bushels at 2*s*.				600	0	0
				£ 1080	0	0

Fifty acres of grass land is to keep two cows and, say, a few horses. The 16 bushels of wheat and 40 bushels of maize per acre are the average of the last five years.

Dairying and Mixed Farming.

	£.	s.	d.	£.	s.	d.
General :						
640 acre farm at £7 per acre				4480	0	0
150 ton silo at £1 per ton				150	0	0
140 head dairy cows at £3 10 *s.* per head				490	0	0
20 breeding sows at £2 per head				40	0	0
150 acres ploughed at 8*s.* per acre for fodder for cows				60	0	0
Harrowing 150 acres, at 2*s.* 6*d.* per acre				18	15	0
70 acres maize planted: seven days' wages and food	2	3	0			
12 bushels seed maize at 2*s.* 3*d.*	1	7	0			
80 acres barley planted: wages and food for planting	2	10	0			
160 bushels seed barley at 2*s.* 6*d.*	20	0	0			
				26	0	0
Labour and machinery for cutting and filling silo				60	0	0
2 plant milking machines, shed and yards				350	0	0
Wages for dairyman and food				83	4	0
» » the boy and food				75	8	0
				£ 5833	7	0
Wheat crop:						
75 acres ploughed at 8*s.* per acre				30	0	0
Cultivating at 4*s.* per acre				15	0	0
Harrowing at 2*s.* 6*d.* per acre				9	7	6
400 sacks at 6*d.*				10	0	0
Harvesting the above at 8*s.* per acre				30	0	0
Carting 400 sacks 4 miles to railway : 6*d.* per bag				10	0	0
				£ 5937	14	6
Maize for grain :						
75 acres maize ploughed at 8*s.* per acre				30	0	0
Second ploughing at 5*s.* per acre				18	15	0
Cultivating at 4*s.* per acre				15	0	0
Harrowing at 2*s.* 6*d.* per acre				9	7	6
Scuffling twice at 4*s.* per acre				15	0	0
Pulling and stacking maize at 7*s.* per acre				26	5	0
1000 sacks at 6*d.*				25	0	0
Threshing 1000 sacks at 6*d.*				25	0	0
Carting to railway 4 miles and loading 6*d.* per bag 1000 sacks				25	0	0
				£ 6127	2	0
Interest 5 %				306	7	0
				£ 6433	9	0

Income.

	£.	s.	d.
Proceeds of 100 cows at about 15*s*. per head per month	984	0	0
10 fat pigs per month, £2 per head	240	0	0
Wheat, 75 acres at 16 bushels per acre : 1200 bushels, 3*s*.	180	0	0
Maize, 75 acres at 40 bushels per acre : 3000 bushels, 2*s*.	179	7	6
	£ 1583	7	6

This 640 acre farm having 300 acres under cultivation has still 340 acres left for grazing.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS.

1088 **Census of Dairy Industries of Canada, 1911.** — *Census and Statistics Bulletin*. Ottawa, Canada, March, 1912.

This Bulletin gives the records of butter, cheese and condensed milk as collected at the census of last year.

Canada There were 3 628 factories in operation in 1910. The quantity of butter made in the year was 59 875 097 pounds, having a value of $15 682 564. This is 23 818 358 pounds more than in 1900, and the value is more by $8 441 592. The quantity of cheese is 231 012 798 pounds, which is more than at the previous census by 10 179 529 pounds, but the value is less by $600 776. The total value of butter, cheese and condensed milk in 1910 was $39 143 089, and in 1900 it was $29 731 922 being an increase of $9 411 167 in ten years.

Taking butter alone, the value of the factory product was $7 240 972 in 1900, and $15 682 564 in 1910, and the value of cheese alone was $21 890 432 in 1900 and $21 620 654 in 1910. The average price of factory butter was 20 cents per pound and of cheese 10 cents per pound, whilst in 1910 the average price of butter was 26.2 cents per pound, and of cheese only 9 cents per pound.

A comparison of the quantities and values of the production of butter and cheese is given in the tables by provinces for the census years 1901 and 1911 for the preceding years respectively.

The increased price of factory butter led to a larger production in 1900, and this was made especially in Quebec at the cost of a lower rate of duty on cream in the United States, which encouraged larger exports to that country.

The number of condensed milk factories in operation increased from four in 1900 to twelve in 1910, and the value of product increased from $269 520 to $1 839 871. There are now six factories in Ontario with a product value of $1 335 689, two in Nova Scotia with $133 956, two in Quebec with $275 000, one in British Columbia with $44 326, and one in Prince Edward Island with $50 900. In 1909 there were two factories in Nova Scotia and one each in Prince Edward Island and Ontario.

Census of Factory Butter.

Provinces	1900		1910	
	Lb.	$	Lb.	$
Alberta	406 120	82 630	2 149 121	533 422
British Columbia	395 808	105 690	1 206 202	420 683
Manitoba	1 557 010	292 247	2 050 487	511 972
New Brunswick	287 814	58 589	849 633	212 205
Nova Scotia	324 211	68 686	354 785	88 481
Ontario	7 559 542	1 527 935	13 699 153	3 482 171
Prince Edward Island	562 220	118 402	670 913	156 478
Quebec	24 625 000	4 916 756	37 346 107	9 895 343
Saskatchewan	339 014	70 037	1 548 696	381 809
Totals	36 056 739	7 240 972	59 875 097	15 682 564

Census of Factory Cheese.

Provinces	1900		1910	
	Lb.	$	Lb.	$
Alberta	27 693	3 970	193 479	23 473
British Columbia	—	—	—	—
Manitoba	1 289 413	124 025	694 713	81 403
New Brunswick	1 892 686	187 106	1 166 243	129 677
Nova Scotia	568 174	58 321	264 243	29 977
Ontario	131 967 612	13 440 987	157 631 823	14 845 661
Prince Edward Island	4 457 519	449 400	3 293 765	354 378
Quebec	80 630 199	7 957 621	67 741 802	6 152 689
Saskatchewan	—	—	26 730	3 396
Totals	220 833 269	22 221 430	231 012 798	21 620 654

1089 ZEEB. **Dr. Eichloff-Schümann's System of Milking.** (Das Dr. Eichloff-Schümann'sche Milchgewinnungsverfahren). — *Deutsche Landwirtschaftliche Presse*, XXXIX. Jahrgang, No. 43, p. 506. Berlin, 29. Mai 1912.

According to this system, the introduction of impurities during milking is avoided by simple precautions and thus an inexpensive, but perfectly pure milk is obtained (*Vorzugsmilch*).

Germany The milker washes his hands before work and then rinses them in a solution of boracic acid. When milking, he wears a white linen smock. The udders and flanks of the cows are rubbed over with a coarse cloth before milking. As the animals often send impurities into the milk with their tails, the latter are made fast during milking with a strap to one of their hind-legs. The first milk obtained, which is possibly infected with bacteria, is milked into a small vessel, not into the milk-pail; after this, operations begin in earnest. A special milk pail has been constructed, designed to prevent dirt and bacteria from falling into it during milkihg. This pail is oval, and has a movable cover. A kind of funnel is inserted in the latter opening not above, but on the side near the front. The milker must accustom himself to milk into this funnel; according to experience, this is an art which he quickly acquires. The work is made somewhat easier by the fact that the pail can be attached to the stool by a support.

The freshly drawn milk is poured into a cylindrical cooling-apparatus. In order that it may not be infected by the bacteria in the surrounding air when flowing down the undulating sides of the cooler, the latter is covered with a removable tin hood. This tin hood has above a funnel to receive the milk, similar to the one attached to the lid of the milk pail. A pipe attached to the pail also serves to facilitate the pouring in of the milk. The milk then flows from the refrigerator through a pipe into a collecting vessel, and is allowed to pass thence by means of a tap into a glass bottle. All utensils are sterilized by steam each time before they are used.

1090 EBER, A. **Investigations concerning the Presence of Tubercle Bacilli in the Milk and Dairy Products of a Small Town in the Harz Mts.** (Untersuchungen über den Tuberkelbazillengehalt der Milch und der Molkereiprodukte einer Kleinstadt). — *Zeitschrift für Fleisch- und Milchhygiene*, XXII. Jahrgang, Heft 8, pp. 243-249; Heft 9, pp. 277-281. Berlin, Mai and Juni 1912.

Germany The milk consumed in a small town in the Harz Mountains is chiefly supplied by the cows of the inhabitants, who according to the size of their landed properties, keep either one or several cows. The total number of these cows is 72. As their milk production does not suffice for the requirements of the town, milk is bought from 9 cow-keepers, who have a few animals, and from a Co-operative Dairy in the neighbourhood. The milk from the latter comes from large intensively cultivated farms, where the cows, which are chiefly from low-lying districts, are kept in sheds throughout the year. The small cow keepers of the town and neighbourhood keep Harz cows; these remain in the open during the summer, but in winter they are often kept in very narrow stalls and fed on hay; they get very little concentrated food.

The writers' experiments were carried out from the autumn of 1903 to the spring of 1910 and relate to milk, butter, and margarine.

During the above period, samples of ½ litre were taken four times. The whole number of samples taken was 161; of these 119 came from the cow-keepers of the town itself, 37 from small establishments in the neighourhood, and 5 from the dairy; the last were mixed milk samples.

In order to establish the presence of tubercle bacilli, 4 platinum loopfuls of each sediment were taken and were injected subcutaneously into the backs of guinea-pigs. The latter were killed six, or at latest from eight to ten, weeks after the injection was made, and dissected in order to investigate the results of the operation.

Three of the 161 inoculated guinea-pigs died very soon, and thus do not count in the experiment.

Out of the other 158, four, *i. e.* 2.53 %, became tuberculous. Tuberculosis showed itself in one out of the 151 (*i. e.* 0.65 %) cases inoculated with the sediment of milk from the town and the small cow-keeping establishments of the neighbourhood, but in 3 cases (60 %) when the sediment from the dairy mixed milk was used. It should be observed, that the 5 mixed milk samples, as well as the others, were taken at different times.

The milk from the small cow-keeping establishments had a higher fat content than that given by the dairy cows, which were natives of the plains; but the latter was freer from impurities than the former. The writer considers that greater cleanliness in milking and an improvement in the stalls of the small cow-owners is greatly to be desired.

Thirty seven samples of butter (each of 125 gr.) were tested, from 16 small peasant dairies where the old method of skimming the cream from pans was in use, and the cream kept for a long time and made into butter when sour. Fifty-four samples were investigated from 18 large farms where separators were employed, and 51 from 18 Cooperative Dairies, also using separators. In these cases also the inoculation of guinea-pigs was employed to determine the presence of tubercle bacilli. In 7 cases, the inoculation experiments were open to question, as the guinea-pigs died from other diseases or from bites at an early stage. In 10 cases, the inoculation was repeated. This leaves 125; of these, 9 animals were affected with tuberculosis. Seven (15.6 %) of the 45 samples of butter which came from Cooperative Dairies, and which were submitted to fair tests, contained tubercle bacilli, and 2 (4.4 %) of those from larger farm dairies. The 35 samples from the small peasant dairies were free from these bacilli. For comparison, 51 samples of margarine were examined; these proved to be all free from tubercle bacilli.

The writer states that in large cow-keeping establishments the possibility of infection is increased by the number of animals kept, and that the intensive use of the cows predisposes them to disease.

He therefore considers that heating the dairy milk to a sufficiently high temperature is imperative.

1091 **The Berlin Establishment for the Destruction and Utilization of the Carcasses of Animals.** (Die Kadaververnichtungs-und Verwertungsanstalt der Stadt Berlin). — *Deutsche Landwirtschaftliche Presse*, XXXIX. Jahrgang, No. 43, pp. 508-509. Berlin, 29. Mai 1912.

Germany

The city of Berlin erected in 1908, at a cost of 1 490 000 M. (£ 74 500) at 50 miles distance, an establishment for the destruction of the carcasses of animals. In the city itself, there are two collecting depôts whence the carcasses are despatched in railway trucks belonging to the establishment. The main building is divided down its whole length into two parts; the " infected " and " non-infected " portions. This division also applies to the staff, and has been made to avoid the spread of diseases through the products. Bathrooms, as well as apparatus for the disinfection of clothes and persons, are provided. On the " infected " side of the building eight large extraction apparatus are set up, each with a capacity of 2 ½ tons.

When the animal has not died from disease, it is first skinned and the skin preserved, then the carcass is placed either whole or in pieces in an extractor. The carcasses of animals which have succumbed to disease are treated without having the skin removed.

Steam under a pressure of four atmospheres is conducted into the apparatus and its contents thus boiled till the flesh separates from the bones and the latter become soft. A decoction is thus produced, containing gluey and fatty substances; it is drawn off by a system of pipes into a special receptacle, where the gelatinous matter and fat separate as a result of the difference in their specific gravity. As soon as the fat swimming on the surface is removed, the gluey mixture is reduced to glue in a condenser.

The drying of the remaining solid substances is then carried out in the extractor itself. This apparatus has a jacket and a rotatory sieve. The steam is first conducted, for four to five hours, into the inner space directly over the portions of the carcasses. Thus the bones as well as the flesh are macerated. Then the steam is conducted into the space between the jacket and the wall of the receptacle and at the same time an air-pump is set in motion, which sucks out the damp air from the interior of the extractor. By turning the cylinder of the sieve, and through the effect of the hot steam between the inner and outer walls of the extractor the contents are equally dried.

These are then conveyed to the " non-infected " division and made into meal, which is sold to the farmers for their stock. The fat is chiefly used in the soap-industry, and the glue and gelatinous substances in the building-trade (for work in plaster and stucco).

The following table gives an idea of the work at the establishment :

Year	Material treated lbs.	Expenditure	Receipts
1909	7 146 000	£17 029 12 0	£17 389 0 0
1910	7 268 000	£17 260 0 0	£19 579 1 0

In 1910 ; 582 794 lbs. of fat (= 8 %), 559 516 lbs. of glue and gelatine (= 7.7 %), 802 500 lbs. of food meal « Tierkörpermehl » (= 11 %), 17 985 lbs. of manure (= 0.2 %), 9 301 hides and skins, 2 953 lbs. of horse-hair.

From the town of Berlin alone, not counting the slaughter-houses, there were received :

1 637 horses, 31 foals, 6 donkeys, 127 cows, 227 calves, 22 sheep, 21 goats, 273 swine, 490 head of game ; also dogs, cats, fowls, fish, crustacea and oysters.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

1092 HATVANY-DEUTSCH, A. **The Sugar Industry in Hungary, 1911.** (Die ungarische Zuckerindustrie im Jahre 1911). — *Wochenschrift des Zentralvereines für die Rübenzucker-Industrie Osterreichs und Ungarns*, L. Jahr., Nr. 6, pp. 288-290. Wien, 17. April 1912.

Hungary

For the last five years we have the following particulars of the sugar industry in Hungary:

Season	Beet treated quintals	Raw sugar produced quintals	Average percentage of sugar in beets
1907-08 . .	17 600 577	2 715 589	15.42
1908-09 . .	17 135 710	2 822 492	16.47
1909-10 . .	21 576 549	3 038 560	14.08
1910-11 . .	25 715 240	3 474 664	13.51
1911-12 . .	30 191 266	4 168 438	13.80

The last season's crop was, as will be seen, satisfactory from the quantitative point of view ; the same cannot be said for the quality. Notwithstanding plentiful rainfall in the spring, which was favourable to early sowing, and despite the abundance of summer sunshine which should have promoted sugar formation, the quality of the beet delivered to sugar-makers did not come up to expectations; in addition, the wet and unusually warm autumn intensified the periodical drawback of bad keeping of the beets, the consequence being a reduction in the average yield.

Notwithstanding this, the notable rises in the international sugar market in consequence of the bad crops in the other beet-growing countries of Europe, owing to the prolonged drought, have redounded to the special benefit of Hungarian beet-growing. As it had been stipulated in the contracts that for each increase of 1 crown in the price of sugar beyond the limit of 20, 22 and 24 crowns per quintal of sugar respectively, an additional price of 4 to 6 heller should be paid, the result was that to the price of sugar of 38 to 40 crowns at the time of delivery there had to be added an extra price of 0.60, 0.80 and 1 crown per quintal of beet, so that the total price of the latter rose up to 3.50 to 4 crowns per quintal. Nevertheless the increased price of sugar up to 80-100 % still left a considerable margin to sugar manufacturers.

During the last two years 7 new sugar factories, either at work or under construction, have arisen, and between 1910-11 and the coming season 1913-14 an increase of 25 % in the total number of sugar manufactories will take place. According to the Author however this rapid growth of establishments does nót correspond to agricultural needs, inasmuch as the capacity of the old installations would still suffice for a long time ; in addition it does not correspond to the increase of internal consumption, so that by rendering it difficult for the factories to secure fresh beet supplies, it will make competition keener within the limited possibilities of exportation.

As regards by-products, owing to the high price of fodder, chiefly consequent upon the failure of the maize crop and the rise in the price of alcohol brought about by the Austrian Spirit Syndicate (Spiritus-Kartell), the price for molasses rose after July 1911 to 13 crowns per quintal, contracts for 1912-13 being made on the basis of 9.50 to 10 crowns per quintal.

Consequently the price of the other by-products likewise underwent notable increase both for wet pulp and dried slices, for which latter there is a demand among farmers, and the prices paid were from 12 to 16 crowns per quintal.

The Sugar Industry in Mozambique, 1911. (Die Zuckerindustrie in Mozambique im Jahre 1911). – *Die Deutsche Zuckerindustrie*, No. 17, pp. 363-364. Berlin, 26. April 1912. **1098**

In Mozambique there are seven sugar-mills. Their output is here given: **Mozambique**

	Tons
Mutamba (in Inhambane)	1 476
Inhamguro (on the Buzi)	3 149
Lusitania	1 673
Marromen (on the Zambesi)	3 445
Mopea	6 397
Villa Fontes (on the Zambesi) . . .	10 826
Inhamacurra (Quilimane)	295

The erection of three or four new mills is contemplated, and of these two are to produce about 20 000 tons of sugar each. At harvest time about 11 000 natives are employed. In the Zambesi district the sugar season lasts from May to December and in Inhambane from June to November. Every workman produces from

2 ½ to 3 tons of sugar, and in Natal up to 4. In Natal the soil is tilled by hand on account of the irregularities of the surface, while in Mozambique almost everywhere steam power is used for ploughing. The area under canes is about 30 000 acres. Some 30 or 40 varieties of sugar cane are grown. The " Uba " cane thrives in Mozambique as in Natal. It ripens after 15 months and yields a crop every year. The yield per acre varies according to the soil; it ranges from 25 to 70 tons of cane and 2 to 5 tons of sugar per acre.

In Mozambique the further development of cane growing and of the sugar industry will not depend so much upon the extension of the crop to new lands, as upon the improvement of cultivated lands by means of irrigation, drainage and mechanical tillage.

Of the yearly production, about 6000 tons goes to Portugal which allows a rebate of half the import duty up to this amount. About 800 tons are consumed in Mozambique itself; 5000 are exported into the Transvaal, where it is hoped in the current year the exportation will be doubled. All the rest goes to Great Britain.

1094 VENTRE, JULES. **Sulphurous Acid in Wine-Making.** (L'Acide sulphureux en Vinification). — *Bulletin de la Société des Agriculteurs de France. Comptes rendus de l'Assemblée Générale de 1912*, 2e Fasc., pp. 524-535. Paris, 15 mai 1912.

France

The author treats only the two points on which, in a number of cases, the success of using sulphurous acid in wine-making depends. The first, very important, deals with the starting of fermentation, and the second with the absolute necessity of using a starter (pied-de-cuve) whenever sulphurous acid is used in the fermentation vat.

I. RETARDING THE STARTING OF FERMENTATION. — The use of sulphurous acid did not at first become general owing to the prevalent uncertainty as to the conditions of its use. Sulphurous acid added to the pressed grapes or to the must divides into two unequal parts, of which the most important combines with the sugars and the other remains free. This latter alone acts, inasmuch as it is a bactericide, and thus it is easy to explain why two equal doses of sulphurous acid do not always act in the same way. Account must be kept of the following factors:

1. *Influence of the medium.* The quantity of free sulphurous acid varies inversely with the amount of sugar in the must.

2. *Influence of the nature and of the mass of ferment.* Among the three principal yeasts which concur in the spontaneous fermen-

tation of must the apiculated ferment is the most sensitive, next comes *Saccharomyces pastorianus* and lastly the ellipsoid, the true vinous ferment. Besides, the antiseptic will have all the greater effect, the less developed the micro-organisms are.

Though a limit to the sensibility of the yeasts cannot be fixed (the author having ascertained that ellipsoid ferments resist much stronger doses of sulphurous acid than those usually experimented with in laboratories: 50 to 60 milligrams) it may be admitted that in most cases a dose of 50 mg. of free sulphurous acid is sufficient to retard the development of secondary germs (apiculated and *pastorianus*) while permitting the development of the elliptic. Therefore if the fermenting grapes are to be purified, the whole amount of sulphurous acid must be used in one dose, leaving in the medium at least 50 mg. free. This dose is obtained by employing 0.68 to 0.91 gr. of metabisulphite per gallon of pressed grapes.

3. *Influence of the mass of ferments.* — A dose of sulphurous acid which is mortal for a certain number of germs will simply retard their growth if their numbers increase, and even have no effect at all if the cells become still more numerous.

4. *Influence of temperature and of the mass of liquid.* — The doses of sulphurous acid to be used, are rather small in cold countries, while in hot ones (Mediterranean countries) they may become very considerable.

The mass of liquid is also an important factor, because the variations of temperature are in inverse proportion to the mass and as at vintage time the grapes when picked are warm while the cellars are cool, the large mass will keep warm longer than a smaller one, and usually large vats begin fermenting sooner than small ones.

5. *Advantages derived from retarding fermentation.* — In wine-making with must alone without grape skins, the liquid cannot be advantageously racked unless there be a complete stoppage of fermentation.

It must also be noted that the quantities of antiseptics to be used for the same result go on increasing rom the beginning towards the end of the vintage, because the atmosphere of the cellar gets always more laden with ferments (influence of the mass).

By retarding fermentation for 24 or 36 hours a vintage soiled by mud, or containing foreign matter, may be completely purified and give an excellent product.

In hot countries, retarding fermentation allows, if the cellars are fairly cool and well conditioned, of its being conducted at a lower temperature and without the use of refrigerators which are sometimes of difficult or impossibile application.

In Algeria, in most farms, sulphurous acid has replaced refrigeration.

In fermenting the must together with the grape skins retarding fermentation allows of a rapid maceration and a relatively short period of fermentation, thus diminishing the time of contact between the must and the solid parts of the vintage without in any way diminishing the colour of the wine, combining the advantages of highly coloured and very fine wines.

6. *Drawbacks of retarding fermentation.* — The chief drawback is the longer occupation of fermentation vats; there is also a loss of time. But these inconveniences disappear in comparison with the advantages, because they may be avoided in practice by the use of starters.

II. REASONS IN FAVOUR OF AND NECESSITY OF THE STARTER. — After the use of sulphurous acid, it is advisable, in order not to waste time, not to wait for spontaneous fermentation to set in, but on the contrary, to start it at once by introducing an enormous number of ferments in full development. Hence the practice of starters. According to the author the volume of the starter which ensures the best results varies between 2 and 2 ½ % of the vintage.

1. *Preparation of the starter.* — The system of a single starter by means of continuous culture must be employed, and therefore a quantity of liquid twice as great as the quantity required must be prepared, calculating always 2 to 2 ½ % of the must.

2. *Technique of preparation.* — Two or three days before the vintage, some sound not over-ripe grapes must be chosen, and in sufficient quantity to provide the starter. About one-eighth of the amount is left to itself if the native yeasts are to be used, or it is heated to 75 to 80° C. to destroy the natural germs, if selected yeasts are to be used.

In this case, in the heated must, as soon as its temperature descends to 28-30° an ample dose of pure commercial ferment is added and the setting in of fermentation will be waited for. The remaining seven-eighths are treated with 17.5 to 20 gr. of sulphurous acid and form an excellent culture must. As soon as fermentation sets in in the one-eighth, either spontaneously or under the action of the added ferments, which generally takes place in 12 or 18 hours, the clear sulphurated must is added, in such a way as not to stop fermentation. This operation takes about 20 hours and by the evening of the first day on which the grapes are vintaged, the starter will be in full activity.

3. *Way of using the starter.*

a) Taking the quantity of must required to supply the starter: During the time that the vat or tun is being filled and as soon as it can conveniently be done, the must to be replaced is drawn and immediately treated with sulphurous acid, after which it is put aside to be used after the starter has been poured into the vat.

b) Treating the vintage with sulphurous acid: this will be done by drawing some must from the bottom of the vat and pouring it in again at the top.

This will be done either at the end of the day's work or as the grapes come in, always however taking care to introduce the maximum quantity of sulphurous acid that has been beforehand fixed upon.

c) Adding the ferment to the vintage or to the must: This third operation may be carried out like sulphurating, either at once, or successively. Most frequently it is done at close of day by " remontage ". About half the amount of the starter is allowed to flow into the pump tank into which the must from the vat to be started is also allowed to flow. The operation of " remontage " must last about 20 minutes so as to render the medium thoroughly homogeneous. " Remontage " is also useful when the starter is added as the grapes come in, as by this practice not only does the medium become quite homogeneous, but the must gets well aerated, and the reduction of sulphates or of the sulphurous acid is avoided as well as the consequent taste of sulphuretted hydrogen.

In wine-making when the must is separated from the skins (vinification en blanc) the starter is used as for the fermentation with skins, unless the must is to be racked, in which case the addition will be made to the clear liquid immediately after racking.

4. *Economical advantages of the starter.* — If it be admitted that by means of a better utilisation of the sugar there is an increase of 4 or 5 tenths of a degree of alcohol, it will easily be understood that if a considerable quantity of pure ferments in full activity are not introduced, in one time, into the medium, there is the risk that the native germs will multiply and transform the sugar which ought to produce alcohol into other bodies such as volatile acids; the wine would be depreciated and would favour the development of germs causing diseases in it. Lastly the wine-maker has at his disposal the means of regulating the fermentation and of foretelling, within a few hours, the best moment for racking.

PLANT DISEASES.

DISEASES NOT DUE TO PARASITES AND UNKNOWN ORIGIN

BUTLER, E. J. **Preliminary Report on « Ufra » Disease of Rice in Noakhali District**. (Communicated to the International Institute of Agriculture by S. G. Hart, Director of Agriculture, Bengal). **1095**

India: Lower Bengal

« Ufra » disease of rice in the Deltaic districts of Eastern Bengal was first investigated by Mr. C. W. Mason, Supernumerary Entomologist, early in November, 1908. His visit to Comilla, where this disease was seen, was consequent on a report by Babu Anukul Chandra Roy, Honorary Correspondent of the Agricultural Department, who stated that the disease was prevalent in Noakhali and Tippera and was probably due to a soil fungus. Mr. Mason reported as follows:

« This disease (« Woofra » of paddy at Comilla) is apparently not caused by insect attack. The first appearance of *Woofra* occurs in September at the end of the rains. The ends of the leaves of plants affected turn brown, afterwards the blossom which is just forming, and then the whole plant, dies off; the attack commences in the same field every year, in small patches which spread wider and wider as the season advances. Many plants however do not die immediately but merely look stunted in growth and produce little or no seed. Cultivators seem to think this is due to drought, but the leaf is, if any thing, while green a darker green than normal and certainly not suffering from drought, which would make the leaf pale. The plant has a leathery and drier look. The disease occurs on *dry land* and wet flooded lands alike, and does not affect any special variety of paddy. As far as is known all are liable to the disease.

« Often one small field may be affected in the middle of large areas of paddy, none of the surrounding plots being attacked, though the land is apparently cultivated at the same time, manured and treated in the same way as surrounding plots ».

Mr. Mason submitted specimens on his return and Dr. Butler reported that he could find no definite evidence of fungus disease, but that the characters of the attack resembled those of the well-known « brusone » or « blast » of rice, which causes great losses in Italy, the United States and Japan, but the origin of which, in spite of a great amount of investigation, is still obscure, some holding that it is due to the attack of a fungus known as *Piricularia Oryzae* (often found on rice in India), others that it is physiological and due to want of aeration of the soil and similar external conditions.

As a result of these reports, leaflet No. 1 of 1909 was issued by the Department with a view to calling attention to the disease and obtaining further information regarding it.

In November 1910 Babu A. L. Som, Mycological Collector of the Department, visited Lakhipura, Ramganj and Begumganj thanas of Noakhali District, where *Ufra* was reported to be causing great damage, and also collected specimens of the same disease in Comilla and Chandpur. From his report it appears that the disease was noticed as early as August, always in low land paddy, nearly three-fourths of the crop being eventually lost in some of the affected areas. The cultivators attributed it to various causes, none of which appeared to stand the test of being generally applicable to all parts of the affected area. It occurred almost exclusively in broadcast Aman paddy, being only rarely found in the transplanted crop. In dry seasons, or where the water is shallow, *Ufra* was said not to do harm, though statements were made by some cultivators indicating that paddy does suffer from some cause other than that which produces *Ufra*, under these conditions.

Babu Som describes three varieties or stages in the disease. In the first, which is called *Pata* (or leaf) *Ufra*, the plants are affected early, before the ear begins to form, and the leaves show a reddish or blackish appearance. In the second, *Thor* (or swollen) *Ufra*, the attack is evident when the ear is forming, and the arrested inflorescence remains enclosed in its sheath, leading to a swollen appearance of the upper part of the axis. The third or *Pucca Ufra* is characterised by the failure of the grains to set, though the ear escapes from the sheath. In all these cases a discoloration of the plant to a reddish or blackish colour (the former generally in *aerial* parts, the latter in submerged) is always present, usually occurring near the nodes and affecting only a limited area. Often this discoloration is confined to the upper part, the base of the plant appearing to be quite normal. The attack may commence in a small patch and spread to the surrounding crop gradually, or may appear simultaneously over a whole field. It was stated that a plot affected one year is not necessarily attacked in the following year.

As a result of his observations Babu Som concluded that the disease was not fungal, but caused by insects, which he observed throughout the affected crop. He failed, however, to convince educated inhabitants of the affected tracts that these insects (which appear to be well-known to the cultivators) are the real cause of the disease. For instance, the Honorary Correspondent of the Department at Chaumuhani, Babu A. C. Basu, was still of opinion in 1911 that « some damage is done by *Majra* insects, but they cannot entirely ruin big fields in this way. *Majra* insects have been found, but only in a very few of them ».

In August 1911, the 2nd Deputy Director of the Department visited the neighbourhood of Noakhali with Babu Som. The latter submitted a report of his work, with marginal notes by Mr. Birt, and excellent specimens, partly preserved in spirit. This year the disease appeared in the last part of June, nearly two months earlier than reported the previous year. The paddy crop consisted for the most part of broadcasted aus and aman paddy mixed, and the country was flooded to a depth of from 2 to 3 feet, excepting the bunds and village sites. The aus paddy had mostly been just harvested, but about 5 per cent of the aman crop was found to be diseased. The cultivators stated that the attack was still in the earlier stage and that the whole area would be severely affected in a month's time. The parts visited were much the same as those traversed by Babu Som in the previous year. In most of the tracts no evidence was obtained of any serious attack of insects, a few cases of damage to aus paddy by stem borers and by flooding with sea water being attributed to *Ufra* by some cultivators, but being more probably due to these other conditions. The term *Ufra* was found to be very loosely applied, almost any disease (even red rot of sugarcane) being sometimes known by this name. The definite disease to which this term should be restricted was described by Mr. Birt as follows : — « The characteristic symptom of the disease in the earlier stage is the presence of brown patches on the stem, usually in the internode immediately below the leaf sheath containing the undeveloped ear. The tips of the leaves turn brown, and eventually die, and the ear does not mature properly ». Babu Som notes that affected plants do not die even after a month, but are stunted in growth. This disease commences in a patch and gradually spreads with the current (Mr. Birt does not confirm the latter part of this statement). Both aus and aman are affected (as the aus was harvested this is evidently the cultivator's statement), aman being most damaged. The disease has been known for 30 years and has done considerable damage for 20 years. Babu Som abandoned his view that *Ufra* of paddy is due to insects, but whether caused by fungi or conditions of soil or water he could not say.

At the time of Dr. Butler's visit, four months later, the fears of the cultivators for their crop had been fully borne out by the result, so far at least as Begumganj thana was concerned. In several fields in the neighbourhood of Chaumuhani, the crop was not worth harvesting, in others a 2-anna crop alone was obtained. A rough estimate for the thana, made by some intelligent people questioned, was an 8-anna harvest. The author considered this was too high, but much of the best crop had been harvested and possibly all the thana was not equally severely diseased. A rough estimate made by Babu A. C. Basu of the loss caused in 1910 in Begumganj thana, was 200 000 maunds of grain.

An examination of affected fields with Messrs. Fletcher and Birt, showed that Babu Som had some excuse for thinking that insects caused the damage, for at this period, when the remnant of the crop not already harvested was dead ripe or over ripe, very many plants were attacked by borers and other insects. If it had not been for the earlier reports it would have been extremely difficult to separate out the cases of injury by insects from those suffering from true *Ufra*. Careful examination however showed that a large proportion of the plants displayed the characteristic symptoms of the conditions described by Babu Som as *Thor Ufra* and *Pucca Ufra*, and attention was soon directed to the seat of attack at or above the node next below the inflorescence and at the base of the latter. In *Thor Ufra*, as a rule, the sheath enclosing the arrested ear is swollen from the presence of the latter within it and is marked by brown bands, especially at the base and about half way up. On removing the sheath, the ear is found to consist of undeveloped, often mouldy grains, and the peduncle, just above the node at the base of the inflorescence, is shrunken, blackened and flaccid. The blackening here may be hidden by a growth of moul The upper part of the next internode is usuallly unaltered but its base is soft, thin and blackened. Sometimes the stem may be similarly affected just above some of the lower nodes, but very often the attack is confined to the upper one or two internodes only. The blackening may affect the outer leaf-sheaths at the level of the attacked internodes, but is often invisible until these are stripped off and the stem exposed.

In *Pucca Ufra* the ears escape from the sheath wholly or in part but are always light, bearing shrivelled or unfertilised grains, which are often blackened by the growth of saprophytic fungi, and are frequently shed early. The enclosing leaf may be much twisted and may imprison the upper part of the ear, while the lower escapes, thus giving rise to curiously distorted heads. The upper leaf is more frequently and more completely turned brown than in the condition described above as *Thor Ufra* and ultimately dries up and splits into shreds.

Though the earlier condition known as *Pata Ufra* was not visible at the date of my visit, the spirit specimens collected by Babu Som last August show its main features. In this stage the affection is not distinctly localised to the internodes of the stem and their sheathing leaves, but brown spots are found on the leaf blades and small brown lesions are scattered on the stem, not concentrated into a single definite disease-area above the node. The tips of the leaves are also often withered. How far any or all of these are characteristic symptoms cannot be judged without field observations. The characters of the earlier stages of the affection are, however, clearly not as definite as those of *Thor* and *Pucca Ufra* and further examination of the commencement of an attack is required.

The field examination indicated that insects cannot be held directly responsible for the disease. Many typical cases were found in which there were no insects at or near the affected portions of the stem. Dr. Butler has since carried out a microscopical examination of a large number of specimens. The results are in every case the same. No fungus has been found with sufficient regularity to suggest that the disease is primarily due to a parasitic fungus. There are fungi present in a large number of the specimens, and there is as yet no definite evidence that one or other of these may not be parasitic. But if a disease of such virulence were directly caused by a fungus, the microscopic evidences of the attack should be sufficiently visible to enable the cause to be identified. Instead there are only superficial moulds with little tendency to penetrate the tissues until the plants are withering. On the whole, though the point requires further study, especially the isolation of one or two of the more constant forms found at the discoloured parts of the stem, and the testing by inoculation of their parasitism, the conclusion arrived at is that the disease is probably not caused by a fungus.

In all the cases examined, however, there is another organism, neither an insect nor a fungus, which is undoubtedly parasitic and which would entirely account for the symptoms observed. This is an eelworm belonging to the genus *Tylenchus.*

This worm is very minute, practically invisible to the naked eye, and usually occurs in colonies on the discoloured parts of the plant. In the spirit specimens of *Pata Ufra* collected by Babu Som last August, a few of these worms were found on the leaves and especially on the minute scattered lesions on the stem. In December much greater numbers were present, entirely collected in *Thor Ufra* at the diseased areas above the upper nodes and on the inner surface of the leaf-sheaths surrounding these areas. In *Pucca Ufra* they are found in still greater numbers within the glumes of the shrivelled grains. None were found in the lower parts of the plant, including the roots, or in the soil. It appears that the worms first collect on the leaves at the time of the earliest recognisable symptoms, being then few in number, and spread to the stem, where they cause isolated lesions, often very minute. Later on they increase in numbers and collect at the upper nodes. Later on again they move up into the ears. They move but little, even when placed in water, seeming to settle down and go through a whole cycle in a particular spot. Possibly as in some of the allied forms, the period of active movement is confined to one or other of the larval stages, and is transient. Evidences of at least two completed life cycles were obtained, larvae, adults and eggs laid by the latter being found in the August specimens, larvae only in milder cases in December, and larvae, adults and eggs again on fuller examination of cases of *Pucca Ufra* made at Pusa. The worms collected in December are still (February) alive but have mostly passed into a dormant condition, lying coiled up within the grains and uncoiling slowly on being placed in water. No newly-laid eggs have been observed recently and it is fairly certain that the December generation has not given rise to a new generation since collecting. This may be due to the dryness of laboratory conditions, and in the field there may be a continuous succession of broods, if the worm is able to obtain food either saprophytically or from another host plant.

The genus *Tylenchus* contains parasitic and semi-parasitic forms which live on plants; a few saprophytic forms are also known. Most of the two former classes are capable of penetrating into the tissues of the host. All feed by puncturing the cells of the plant by means of a spine, which can be protruded from the mouth, and sucking the juices. The species found on rice at Noakhali was undoubtedly feeding on living plants, but no case has yet been observed in which the worm entered directly into the tissues. It appears to remain always on the surface, usually between the sheaths and the stem. It is unsafe to state definitely at present that it is the cause of *Ufra*; inoculation experiments must be made and the possibility that it merely opens a passage to some other parasitic organism, fungal or bacterial, must be borne in mind. The need for caution is emphasised by recent work in Java, where for years a very serious paddy disease known as *Omo Mentek* has been under study. The earlier observers attributed it to a *Tylenchus*, which is found commonly in the roots of diseased plants. Recent work, however, has thrown doubt on this view and the true cause is still obscure. Though possessing certain points described as *Thor Ufra*, the earlier symptoms are different. The Java *Tylenchus*, *T. Orizae*, is not identical with that found at Noakhali, and occurs in the roots, not above ground. So far as can be ascertained the rice *Tylenchus* of Eastern Bengal is an undescribed species, and no help can be got from published literature in working out its life history and biology.

In order to ascertain if possible the distribution of this species in India, Dr. Butler worked through all his collections of diseased rice of which the cause was not known. Amongst these are Mr. Mason's collections from Comilla in 1908 and numerous collections from Bengal proper. Many of these represent a disease exactly similar to that collected by Mr. Mason at Comilla under the name of *Ufra*. In Bengal the local names of this disease are many; one of the commonest is *Chatra*. Both transplanted and broadcasted paddy are affected, ears are usually not formed, the leaves turn reddish and the stem is marked by shrunken, blackened, flaccid areas just above the nodes, often towards the base of the stem. In none of these cases were eelworms found, and the disease is apparently identical with that known as "Blast" in the United States and "Brusone" in Italy. It is different in several respects from the Noakhali disease, principally in checking the formation of the ear and in some of its pathological effects on the tissues. It is probable, therefore, that there are two distinct paddy diseases in Bengal and Eastern Bengal, marked by stem lesions above the nodes, and the *Ufra* seen by Mr. Mason at Comilla is not the same as the *Ufra* at Noakhali. The latter has not been found elsewhere than in the deltaic districts of Eastern Bengal. The former appears to occur in Bengal, Bombay and other parts of India.

A disease which has been known for twenty or thirty years in Noakhali would be likely to have spread extensively unless there are some special conditions of climate, soil, water-supply or treatment of the crop or the land in this district.

Climate can have little connection with *Ufra*, as the disease occurs (according to Babu Som's collections and observations) from near Mymensingh to the Bay, and the climate of this area is not widely different from that of Lower Bengal or the Irrawaddy Delta where it has not yet been reported.

The *soil* is apparently the usual alluvium of the lower Delta of the Ganges and Brahmaputra. It is said to be very acid. In Noakhali it is but little above the water level of the estuaries and is yearly inundated, excepting the roads, bunds and village sites, remaining under water for several months. The rice land, which forms three-fourths of the district, receives little cultivation and remains either under water or covered with the long stubble, trampled down by cattle, for the greater part of the year. The lower lands where *Ufra* chiefly occurs are only cultivated once in the year, in February-March, shortly before sowing. Hence they remain under conditions which preclude aeration for most of the year. Nitrification cannot occur to any extent in such soils. Considerable quantities of organic nitrogen must be returned to the soil with the stubble, as it is the practice to leave a very long stubble at harvest; this is grazed by the cattle in the cold weather, but much is trampled into the soil and the remnant is ploughed in February-March. We were informed that the stubble is not burnt as is common in some other rice tracts in Bengal. Denitrification probably occurs (1) and under certain conditions it has been shown by recent work in Japan and the United States that there may be produced in such a soil an accumulation of nitrites which become poisonous to rice at a concentration of about 5 parts per million. Whether these conditions are ever fulfilled in the present case, especially as manuring is not practised, is doubtful, but the possibility must be borne in mind in considering any modifications of the current methods of treating the land. Rice prefers its nitrogen in the form of ammonium compounds, not as nitrates. Hence it by no means follows that the ordinary methods of improving soil fertility by stimulating nitrification (cultivation, aeration, liming, draining, etc.) will be beneficial in such soils; the reverse is likely to be the case, for if there be an accumulation of nitrates in the soil at the time of the annual inundation, denitrification probably sets in, with loss of nitrogen and accumulation of nitrites. If on the other hand, the conditions are unfavourable to complete oxidation, the breaking down of organic nitrogen may terminate at the formation of more beneficial ammonium compounds.

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(1) See *B*. Jan. 1912, No. 61. (*Ed*.).

The *water-supply* does not differ materially from that of other parts of Lower Bengal, except in the annual inundation setting in early and remaining late. In the coast tracts there is said to be some accumulation of salt but this does not appear to be marked further inland.

Treatment of the crop and of the land. The main crop appears to be mixed aus and aman broadcasted paddy. It is the latter which chiefly suffers from *Ufra.* A little disease was, however, seen in the transplanted aman and as usual *Tylenchus* was found on the diseased patches on the stem. The transplanted crop is grown on higher land than the broadcasted, but a difference of a few inches is enough to determine which variety will be grown. In some places the transplanted aman follows jute or aus paddy. In any case the land is better prepared than for the broadcasted crop and this, together with the shorter period of submersion, may be sufficient to account for the comparative immunity of the transplanted aman crop. The broadcasted aus may escape, if it does escape, merely because of its short period of growth. The broadcasted aman is apparently grown under worse conditions than in any other considerable paddy area described. It is subject to submersion in many feet of water for a very long period. At harvest time it is cut so as to leave a long stubble behind. The land is left, after drying, under a matted coating of this stubble, trampled down by the cattle. At the time of sowing the new crop, it receives shallow ploughing, by which the remnant of the stubble is buried. For the rest of the year it is untouched. Neither cold weather, ploughing nor burning the stubble, nor cutting the straw close to the ground and stacking it for fodder after treading out the grain, is done. Either the crop or its stubble is on the land for the greater part of the year. If there is any special condition in Noakhali district which predisposes to *Ufra,* it must, in Dr. Butler's opinion, be looked for here. Whatever the cause of the disease, whether eelworms or a parasitic fungus or bacterium, provided only that it is a disease caused by some foreign organism, more favourable conditions for its continuance and multiplication could not be imagined.

If then it is worth while experimenting with a view to finding some remedy for *Ufra* even without knowing its exact cause, such experiments should in the first place be directed to determining the effect of modifications of the treatment of the crop and the land. It may be that, for the reasons given above, it is sound agricultural practice not to work the land in the cold weather. Nothing but experiment can settle this point. It would be better to get a somewhat inferior crop free from *Ufra*, than to have a bumper crop ruined by this disease in the last few months of its growth.

Again there is a well-founded objection to burning the stubble in that there is no other cattle food available in any quantity. But I am told that in Chittagong, where it is stacked, a surplus of paddy straw suitable for fodder is available and could be delivered by boat transport very cheaply. Why the straw is not stacked in Noakhali does not seem clear, probably because the late subsidence of the water renders it liable to rot or not worth stacking. It cannot be good cattle food, trampled down and rotting on the fields as it is, and the cattle of the district seem to be in a miserable condition. Where there is so little work for them to do, it is not be expected that they would be well looked after; but if burning the stubble led to reducing *Ufra*, an additional argument in its favour might be that it would force the people to buy decent fodder from outside.

Where so little is known scientifically about the conditions necessary to produce a good crop as in paddy cultivation, Dr. Butler considers that instead of blind experimenting under circumstances which prevent accurate supervision, it would be better to endeavour to adopt wholesale the practices of some neighbouring district, where conditions are similar or nearly so as regards the water supply.

However, the first thing to do is to find out the effect on the disease of ridding the fields of their dense covering of stubble between successive crops.

1086 GATIN, G. L. **A New Contribution to the Study of the Effect of Coal Tar Dust on Plants.** (Nouvelle contribution à l'étude de l'action des poussières goudronneuses sur les plantes). — *Annales de la Science agronomique française et étrangère*, 29^e Année, No. 5, pp. 321-331, fig. 1-4. Paris-Nancy, mai 1912.

France The present article is the result of experiments of which the first data have already been published by the writer (1).

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(1) See *B.* June 1912, No. 967. (*Ed.*).

These researches were undertaken with the twofold aim of comparing the different substances used for hardening roads, and of explaining their injurious action. Some of the experiments were made in a cool green-house, the temperature of which was generally kept between 5° C and 12° C, and the others were carried out in a warmer house, kept at 20° C. Both green-houses had the same exposure and lighting.

As subjects, M. Gatin chose geraniums (*Pelargonium zonale* and *P. peltatum*).

The plants were examined once a week; they were powdered over with dust by means of small bellows, and in such a manner that the surfaces of the leaves were always covered with a thin layer of impalpable dust in order to imitate the state of affairs which obtains at the road-side.

The substances used were as follows:

a) " tarvia, " a product with coal-tar basis ; *b*) " bitulithe, " a compound much in favour in America and into the composition of which no coal-tar matter enters ; it is entirely made of bituminous substances ; *c*) " glutrin, " a product found in the bisulphide lyes used only in the chemical preparation of wood pulp ; *d*) road dust (ordinary, without tar); *e*) tar from " boghead " (a fossil fuel analogous to coal) distilled at 270° C, with the addition of asphalt; *f*) gas tar ; *g*) mixture of 60 % resin (commercial residuum of the rectification of gas tar) and of 40 % anthracite oil without anthracene ; *h*) asphalt ; *i*) phenol ; *j*) naphthalin ; *k*) paraffin.

Some of these substances had been collected in the form of dust from different roads and were used direct, in order to make the experimental conditions as similar as possible to the natural ones. Others were prepared by the writer himself.

The gas-tar had been partly obtained from a road whence the tar had at the time almost disappeared, and partly from the washings from the gutters. Dust was also collected from a recently tarred but completely washed road, and this was compared with the same dust which had not been washed.

The experiments proved that, from the point of view of their injurious action, the different above-mentioned substances can be divided into two classes:

1. Injurious substances (in decreasing order of virulence) : mixture of 60 % resin and 40 % anthracite oil without anthracene; " tarvia " ; gas-tar ; old or washed gas tar.

2. Substances slighty harmful or harmless (in decreasing order of virulence) : " bitulithe " ; asphalt ; "boghead"-tar.

" Glutrin " and ordinary road dust are not injurious.

From a practical point of view, it would be well for experiments to be made on a large scale with those substances which seem harmless, or only slightly injurious, in order to ascertain if their effect is equally negligible in the very sunny days of summer. Should this prove to be the case, preference would then be given to the cheapest compounds and those most suitable from the technical standpoint.

The effect of the coal-tar substances appears, according to experiments made by sprinkling the lower surfaces of the leaves with dust, to be due, as Mirande suggests, to the tar vapours given off by the tar dust, which come in contact with the upper surfaces of the leaves and cause injuries of two kinds. In some they seem the result of violent action (rapid destruction of the tissues, varnishing, turning yellow and perforation); in others, on the contrary, the effect shows itself more slowly, and only gives rise to modifications of growth, which cause the leaves to roll, and to abnormal cork formation.

1097 JACCARD, PAUL and BURNAT, JEAN. **On a Case of " Court-noué " observed on Vines in the Neighbourhood of Montpellier.** (Sur un cas de " Court-noué " observé aux environs de Montpellier). — *Revue de Viticulture*, 19ᵉ Année, Tome XXXVII, No. 961, pp. 665-668. Paris, 16 mai 1912.

France

In a vineyard on good soil consisting from 1880 to 1903 of Aramon on Riparia, a first attack of " Court-noué " was observed in 1897 as well as a stunted condition, which spread slowly till the vines were grubbed in 1903. The following year, the vineyard was replanted with Grand-Noir on Rupestris du Lot, and at the end of three years, these also were attacked by " Court-noué. "

Microscopic examination of the organs of the affected stocks and their comparison with those of the healthy vines, permitted of the following facts being ascertained. The stunted condition observed is not the result of any parasites (insects, worms, fungi, or bacteria) living either on the surface of the plant or inside it. The organs, on examination, showed no traces of gummosis, nor anything abnormal in the number or distribution of the gummy pockets or tyloses. Compared with the shoots of the healthy vines, those of the diseased stocks contained about the same amount of starch, but were less lignified, and gave, with the proper reagents (especially with phloroglucin and hydrochloric acid) a more or less strong ligneous reaction. The leaves of the most stunted stocks yielded to the slightest pull, and showed all the characteristics of autumnal fall on account of the premature formation of a peridermic or absciss layer, such as normally appears one or two months later. Contrary to what is observed when the leaves of Grand-Noir turn brown naturally, the alteration in the mesophyll usually extended from the edge of the leaf to the centre and the veins. The leaves of stunted stocks showed an alteration of the chlorophyll (chlorosis), which began at the veins ; these had a reddish hue, thus presenting a striking contrast to the edge of the leaf which was still green.

Miscroscopic examination having revealed no parasites or any kind of anatomic lesion or traumatism due to frost, lends probability to the hypothesis that we have here to do with a physiological disease affecting nutrition, a malady whose cause can be determined only by means of experiment.

In the absence of positive conclusions, one of the first causes of the stunted growth of such plants as Aramon or Grand-Noir must be sought in their great productivity, which causes rapid exhaustion, not only of the soil, but also of the plant itself.

" Court-noué " can hardly be attributed to the effects of grafting, as it appears equally on ungrafted vines ; anyway, grafting can only be responsible to a negligible degree. Further, the disease called " court-noué " and the stunted growth of the vines are possibly caused by a variety of circumstances to be determined in each separate case. In the cases under consideration, it might also be well, perhaps, to examine the method of cultivation. The roots of the stocks investigated, instead of growing vertically downwards, bent back towards the surface and encircled the base of the stem ; this appears to have some connection with the method of manuring in holes (" en godet ") which obtains in the neighbourhood of Montpellier. It is possible that, by causing the roots to grow constantly in the same part of the soil, instead of encouraging them to penetrate into all the soil at their disposal, this system leads to the exhaustion or fatigue of the soil, which is thus too heavily taxed. The manure should be distributed evenly, in such a manner as to encourage as abundant and extensive root development as possible.

In addition, it is necessary to restrain by means of severe pruning a productivity which, sooner or later, must be injurious to any cultivated plant.

1098 PICCIOLI, LODOVICO. " **Shakiness** " **of Wood.** (La cipollatura dei legnami). — *Atti della Reale Accademia economico-agraria dei Georgofili di Firenze*, Anno 159°, Disp. 2ª, pp. 154-173, fig. 1-15. Firenze, 23 aprile 1912.

Italy

Wood is subject to a fault known as " shakiness " or " ring shakes ", that is to say it forms superposed concentric layers which can be detached separately after the manner of the coats of the onion. This fault is due to the separation of two consecutive annual rings which do not reunite. The defect is partial when it describes an arc of a circle and total when it covers the entire circumference or the whole length of the annual ring. Total lesions are almost always of great axial length and extend several metres along the trunk parallel to the axis. Sometimes the fault extends into the largest branches for a length of 16 to 20 inches, but it rarely occurs independently of the trunk. Partial lesions are much shorter, mostly limited to 3 feet above the butt, and may descend to a foot or two below. The defect occurs in old and middle aged rather than in young wood. Eccentricity of the trunks is propitious to the partial shakiness which is seen in the weakest annual rings, more especially the thin ones of oak or Turkey oak and the thick ones of conifers; complete ring shakes on the contrary are almost always observed in even centred trunks.

The fir wood at Pescopennataro in the province of Campobasso presented the Author with ample material for observation in relation to the fault of ring shakes. The latter affects the quality of the wood and renders it unsuitable for many purposes, thus reducing its value.

In standing trees the deficiency is not marked by any external signs, so that even those with the best appearance may be defective. When the fault makes its appearance in the sapwood, the foresters may discover it by striking the tree round about with a hammer, or with the handle of the axe, judging its condition from the sound it gives out. If the shakiness lies deep, recourse may be had to the extractor gimlet of Pressler, which, inserted horizontally and radially in the trunk, brings with it when withdrawn a small cylinder of wood 7 to 8 mm. in thickness which serves for examination.

Predisposing causes to ring shake are all factors which tend to reduce the homogeneity and cohesion of the ligneous tissue, producing a considerable difference of growth in the annual rings. The effective or producing causes may depend: (*a*) on mechanical forces, such as the wind, which most certainly exercises the strongest effect in bending and twisting; (*b*) on frosts and thaws; (*c*) on shocks, blows and circular stripping of bark, or on internal lesions produced by lightning; (*d*) on the action of fungus mycelia.

Shakiness more frequently affects trees with hard wood, or with distinct sapwood and heartwood, than those with soft wood. It may be said however that no species is immune against it.

To prevent the injury of shakiness in mixed forests, as the defect is more frequent and serious in proportion as the saplings are farther apart and more isolated, it will be expedient to leave 40 or 60 instead of 20 or 24 per acre, providing for their thinning out by successive fellings when they have gained strength and the tissues have adapted themselves to the new condition of the forest. In high forest, successive, frequent, but limited fellings should be adopted, or intermittent fellings of small quantities in preference to extensive ones, so that the difference in growth of thickness of the trunks should not be sudden, and the trees should find mutual protection for a greater number of years. When felling, the trees to be cut down should be marked with a hammer and not the saplings or reserves.

Finally, preventive precautions against frosts and the action of insects and fungi should not be neglected.

BACTERIAL AND FUNGOID DISEASES

FUNGOID DISEASES.

Miyake-Ichiro. **Studies in Chinese Fungi.** — *The Botanical Magazine*, Vol. XXVI, No. 303, pp. 51-66, Plate I. Tokyo, March 1912. **1009**

China

Availing himself of data for study collected in 1908 in Southern China, and in 1910 and 1911 in Pekin and its environs, the Author describes a number of species of fungi, considerably extending the knowledge hitherto possessed with respect to the Chinese mycological flora. Among the species described many are parasites of cultivated or useful plants and already known in other parts of the world; ten, however, are new to science and live on plants important to the agriculture of the country.

1100 GUSSOW, H. T. **Potato Canker imported into Canada** (1). — *Department of Agriculture, Canada, Farmers' Circular.* No. 1. Ottawa, May 1912.

Canada

In recent importations of potatoes from England, the Potato Canker (*Chrysophlyctis endobiotica*, Schilb.) has been discovered. This circular has been issued as a warning against the use by Canadian farmers of such imported potatoes for seeding purposes. The shipments known to have been infected have been destroyed.

The " Destructive Insect and Pest Act " will be invoked against farmers using such potatoes for seed. The first two clauses provide:

" It shall be illegal to sell, offer for sale, dispose of in any way, receive or use, for seed purposes, any potatoes imported from Europe ".

" Every person using for seed other potatoes than such as have been raised by himself must obtain, preserve and exhibit on demand, previous to planting, a certificate from the seller or his agent stating that the potatoes to be used for seed have not been imported from Europe ".

The Act provides for compensation not exceeding two-thirds of the value, in cases where certain conditions have been duly fulfilled.

RAVAZ, L. and VERGE, G. **Experiments on the Infection of the Bunches with Vine Mildew.** (Sur la contamination de la grappe par le Mildiou). — *Le Progrès agricole et viticole,* 33^{e} Année, No. 19, pp. 581-584. Montpellier, 12 mai 1912.

From the experiments in inoculating with mildew bunches of Servan-Rond and Grenache, the Authors deduce that these supply the parasite with a less suitable medium than the leaves. The infection always appears later on the former. This, according to the Authors, explains why the invasions of the leaves and the bunches by the fungus are not simultaneous, as is often observed in vineyards, and also furnishes the reason why the bunches are so rarely attacked by mildew. The invasions are characterised by the appearance of the white conidiophores or the presence of blotches in the latent state. In order that the latter should become clearly manifest on the grapes it is evidently necessary that the needful conditions of moisture and temperature for their development should continue for a greater length of time or be still more favourable than for the infection of the leaves.

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(1) See *B.* June 1912, No. 976. *(Ed.).*

Further, the Authors have found that, among the flowering organs, the corolla is most adapted to shelter the parasite. Then follow the circular swellings which form the point of insertion of the grapes in the pedicels of the bunch; the tissues of these organs present interstices and also have numerous stomata. On the pedicels, and above all the peduncles, the infection takes place less often and the lesions are produced much more slowly. This is due to the fact that the stomata are rare in those parts; the tissues likewise are comparatively compact and perhaps less watery. In the course of the experiments the grapes always remained immune. This observation shows that there is no need to try to defend them direct from the attack of the disease. The points which need protection are the swellings of the pedicel, both because they are very vulnerable and because the rain and dew water accumulates and stagnates at the surface.

1102 PICARD, F. **Descriptions of Two New Laboulbeniaceae, Parasitic on Beetles.** (Description de deux Laboulbéniacées nouvelles, parasites de Coléoptères). — *Bulletin de la Société entomologique de France*, 1912, No. 8, pp. 178-181, fig. 1-2. Paris, 1912.

France. Algeria

Preliminary diagnoses of two new Laboulbeniaceae which are parasites of beetles, found in the entomological collection of M. R. de Borde. They are: *Dioicomyces endogaeus* n. sp. on *Anillus coecus* from Foix (Ariège), and *Cantharomyces Bordei* n. sp. on *Limnichus sericeus* collected at Biskra (Algeria).

The five species of *Dioicomyces* already known are American; three are parasites of *Anthicus* and two of *Bledius* and *Myrmedonia*. Of the four *Cantharomyces* previously known, three are American and one English; all live on representatives of the species *Bledius*, *Trogophloeus* and *Platystethus*.

MEANS OF PREVENTION AND CONTROL.

1103 **Control of Plant Diseases at the Agricultural Experiment Station of Peru.** — See above, No. 1002.

1104 PANTANELLI, E. **Spraying Experiments with Polysulphides and other Fungicides in 1911.** (Esperienze d'irrorazione con polisolfuri ed altri fungicidi, nel 1911). — *Le Stazioni sperimentali agrarie*, Vol. XLV, Fasc. 3, pp. 161-190. Modena, 1912.

Italy

From the experiments carried out by the Author it is found that:

1. The polysulphides of calcium, barium, zinc+sodium, prepared hot, prove to possess an efficacy equal or superior to that of Bordeaux mixture in controlling peach leaf-curl and other cryptogamic diseases of peach and apple.
2. The same polysulphides were successfully applied against the oidia of rose, oak, and *Euonymus*, against *Exobasidium Azaleae*, etc.
3. The polysulphides above mentioned, the mixture of polysulphide of lime and Bordeaux mixture, neutral acetate of copper (5 : 1000) and "silver soap" (Ag 1.04 : 1000) have proved sufficient to keep off mildew and oidium from the vine (Genzano, near Rome, 1911), equalling Bordeaux mixture combined with sulphur fumigations.
4. The said polysulphides are sufficient in a strength of 2 % (of sulphur) for winter treatment, and in 1 % for spring and summer treatment.
5. Polysulphide of barium and still more that of zinc (plus sodium) have a decided stimulating action on growth, especially of peach, and do not injure the leaves or flowers; polysulphide of lime on the other hand is fatal to the foliage of peach in the same way as Bordeaux mixture; it is harmless like the other polysulphides to vines, the leaves of which are on the other hand readily injured by the mixtures based on copper and silver.
6. Polysulphide of zinc (plus sodium) is too expensive; the cheapest fungicide is polysulphide of lime; but polysulphide of barium is preferable, in spite of its cost being greater than that of Bordeaux mixture, owing to its efficacy as a fungicide and insecticide, its non-poisonous nature, etc. "Silver soap" likewise deserves consideration for mixed treatment.

1105 **Use of Lime as a Fungicide, especially against *Fomes semitostus* and other Fungi injuring Roots of Rubber Trees.** — See above, No. 1039.

GRANDERYE, L. M. **A Method of Detecting Arsenical Compounds in Fungicidal and Insecticidal Mixtures.** (Comment déceler les composés arsénicaux des produits cryptogamiques et insecticides). — *La Vie Agricole et Rurale*, No. 27, p. 34. Paris, 1er juin 1912. **1106**

There are at present on the market many fungicidal and insecticidal preparations, which contain in large or small proportions one or other of the numerous forms of arsenic, arsenious acid, alcaline arsenites, copper arsenites, etc.

France

It is useful to be able to determine quickly if such a compound contains these toxic substances, in order that precautions may be taken for the protection of the persons employed and that they may not be used where their after-effect might be injurious.

The process is simple and can be carried out by everyone. Four spoonfuls of good white vinegar are put into a tumbler, and some crystals of soda are added gradually until the resulting effervescence ceases.

The liquid is then poured into an iron ladle which is heated, till nearly all the water has evaporated; when this point is reached, a few grams of the compound suspected of containing arsenic are mixed with the contents of the ladle and heated still more, until the mass is desiccated. If arsenic is present, a gas is set free with a strong repulsive odour of garlic.

This is what has taken place:

The vinegar (dilute acetic acid) with the sodium carbonate has given rise to sodium acetate, which, in the presence of arsenical compounds, causes the formation of this gas called " cacodyle ", of which the odour is characteristic.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

D'AYALA, S. ***Sclerotinia Libertiana*, a Bean Pest.** (Note di Patologia vegetale. Un grave malanno alla fava in Calabria). — *L'Italia Agricola*, Anno XLIX, No. 9, pp. 205-206. Piacenza, 15 maggio 1912. **1107**

Italy: Calabria

For some years past the bean-growing parts in the territory of Monteleone in Calabria have been more or less severely injured by *Sclerotinia Libertiana*.

Greater resistance has been noted in the plants manured with phosphates, and it has furthermore been observed that late plants frequently do not suffer attacks of the parasite or are less subject to them.

1108 MAUBLANC, C. **Diseases of Vanilla** (1). (Maladies du Vanillier). — *L'Agriculture des Pays chauds*, 12^e Année, No. 108, pp. 177-188, figg. 1-18; No. 109, pp. 277-287, figg. 19-29. Paris, mars-avril 1912.

A description of the diseases of vanilla hitherto known in the different countries of the world. These are:

a) Vanilla anthracnose, produced by *Calospora Vanillae* Massee, and found in the plantations in Seychelles, Mauritius, Réunion, Great Comoro, Madagascar, Tahiti, Columbia, the United States and the West Indies. The disease makes serious inroads on the leaves and the trunk, which are covered with characteristic blotches. The parasite makes its way into the healthy plant through any lesions which may be present, and its development is greatly promoted by persistent moisture; on weak individuals it develops much more easily than on strong ones and spreads rapidly.

Hitherto no means of defence have been available so effective as pruning and the destruction of the parts assailed as soon as they present the first symptoms of the disease. A fair amount of benefit is however afforded by those methods of cultivation which aim at placing the plant under better conditions of growth.

Some affinity with the anthracnose fungus is possessed by *Gloesporium affine* Sacc., reported in Germany and Italy; *G. Bussei* Henn. found in Mexico, and *Trullula Vanillae* Henn. from German East Africa.

b) The " brown spot of the stalks ", due to *Nectria Vanillae* Zimm., discovered in the plantations of Buitenzorg (Java), where it causes considerable injury to the stems, and, much more rarely, to the leaves of the plant. To control it recourse must be had to burning the stems exhibiting the blotches produced by the fungus, and those also which have their deep tissues blackened and enclose the mycelium of the parasite.

c) The " leaf spot ", a disease once attributed to the action of various bacteria, but which the majority of mycologists both in

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(1) See also *B*. Aug.-Sept.-Oct. 1911, No. 2990. (*Ed.*).

Europe and Japan regard as non-parasitic, although the causes giving rise to it are not as yet well defined.

d) The " scab of the pods ", a non-parasitic disease which affects the fruits of vanilla.

e) The vanilla rusts, produced by *Uredo Scabies* Cooke, found in Columbia on the leaves of vanilla, and by *Uromyces Joffrini* Delacroix, studied on fruits coming from Tahiti.

f) *Seuratia coffeicola* Patouillard and *S. Vanillae* Patouillard, found on the leaves of vanilla in Tahiti.

g) *Fusicladium Vanillae* Zimm., discovered on the living leaves, in Java.

h) *Phyllosticta Vanillae* Henn., observed in Java, on the leaves.

i) *Amerosporium Vanillae* Henn., found with the last named.

j) *Ocellaria Vanillae* Henn., studied on specimens coming from Mexico.

k) *Cephaleuros Henningsii* Schmidle, a parasitic alga collected in Java, on the leaves.

Uredo Scabies, Uromyces Joffrini, the two species of *Seuratia, Fusicladium Vanillae, Amerosporium Vanillac, Ocellaria Vanillae* and *Cephaleuros Henningsii* give rise to diseases little known as yet, which however do not appear to be productive of serious damage.

BARNA, BALAZS. **The Brown Rot of Fruit Trees (*Monilia cinerea*) a Pest of Cherry Trees. Control Methods.** (A cseresznyefák monilia betegsége). — *Köztelek,* XXII évfolyan, 38. szám., pp. 1416-1417, 188-189 abra. Budapest, 1912. Május hó 18. 1109

Hungary

One of the chief causes of the withering of cherry blossoms, is the presence of a fungus called *Monilia cinerea,* which is the conidial form of *Sclerotinia cinerea,* a parasite which is very injurious to cherry trees in Hungary.

As some of the best remedies, the different preparations with a base of copper sulphate are recommended ; the writer, however, did not find these very efficacious, as they did not destroy the agent of the disease.

From 1909, he gave the following treatment to an orchard containing 20 cherry trees of different varieties, which had long been attacked. He had all the fallen fruits and leaves burnt, as well as all the mummified fruits ; also the weeds ; after this, the soil was turned over. During the winter, at a time when there were no frosts, the trees were sprayed with a 10 % soltution of " dendrin "; this operation was repeated in the spring before the breaking of the buds. At the beginning of June, the soil, already covered with grass, was broken up with the spade and rolled, and when the fruits had reached the size of a grain of maize, they were sprayed with a 2 % solution of copper sulphate dissolved in water. Further, all diseased fruits and those which fell prematurely were destroyed. Dating from the next year, 1910, the writer has obtained very favourable results, and in 1911 the cherry blossom was almost free from *Monilia cinerea.*

1110 NEGER, F. W. **A New Disease of the Leaves of White Alder.** (Eine neue Blattkrankheit der Weisserle). — *Naturwissenschaftliche Zeitschrift für Forst- und Landwirtschaft,* 10. Jahrgang, Heft 6, S. 345-350, Abbild. 1-2. Stuttgart, Juni 1912.

Norway In south-west Norway, in the mountainous belt of which Sognefjord forms the boundary from the interior, *i. e.* in Lysterfjord and Flaamtal, the Author has found the bushes of white alder (*Alnus incana*) affected by two cryptogamic diseases. One of them, due to *Taphrina epiphylla,* gave rise to the appearance of large witches' brooms which were but rarely observed in Germany.

The other disease, still more widespread than the last-named, attacked the leaves, which, on their upper face, showed chalky white spots, for the most part pretty clearly defined and very variable in area. On the basis of the microscopic characters of the disease the Author provisionally designates by the name of *Gnomoniella albomaculans* the fungus which produces it, and which is probably not identifiable with any of the species already known.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1111 DEGEN, A. v. **Germinating Capacity of Seeds of *Cuscuta Trifolii* and *C. suaveolens*.** (Studien über *Cuscuta* - Arten: I. Die Keimfähigkeit von *Cuscuta Trifolii* Bab. und *C. suaveolens* Ser.). — *Die landwirtschaftlichen Versuchs-Stationen,* Band LXXVII, Heft I u. II, S. 67-91. Berlin, 1912.

Hungary The investigations undertaken by the Author with respect to the germinating capacity of seeds of *Cuscuta Trifolii* Bab. and *C. suaveolens* Ser., lead to the following conclusions:

1. The germination capacity of seeds of *C. suaveolens* is incomparably higher than that of seeds of *C. Trifolii*: the former, after 28 months, yields an average germinating percentage of 67.6, while the latter in almost the same time germinates in the average proportion of 47 %.

2. The germination energy is extremely prolonged in both species; though the largest percentage of germinating plants make their appearance the first month after sowing, for many months onwards other seedlings shoot up sporadically, so that the infection, once it has occurred, constitutes a continuous danger to cultivation. Again, although it is true that the seedlings of dodder have a great need of light, which the cultivated plant intercepts, it is no less true that the cutting of the crop restores conditions favourable to the development of the parasite.

3. Owing to seeds of dodder which have not yet germinated after several months, but which have not yet rotted, it may happen that when once the land is infected the infection continues for several years in a latent state, to become manifest in the leguminous plants subsequently sown on the same land.

4. Although the number of seeds of dodder contained in a sample of seed and the knowledge of their germination capacity cannot form a safe guide to the damage which may be produced by a small percentage of seeds of the parasite (owing to the many dangers to which the seedlings of dodder are exposed in the field), it is nevertheless necessary, in examining and checking seeds, to determine the quantity of dodder seeds (and especially of *C. suaveolens*) in every sample.

DEGEN, A. v. **Experiments of Infection with the Seeds of Dodder** **1112**
(*Cuscuta suaveolens*) (Studien über *Cuscuta* - Arten: II. Infektions-versuche mit Grobseide [*Cuscuta suaveolens* Ser.] Samen). — *Die landwirtschaftlichen Versuchs-Stationen*, Band LXXVII, Heft I u. II, S. 92-128. Berlin, 1912.

Together with Messrs. Dénes Korma and Guido Gerhardt, the Author has carried out for two years in succession, at Magyaróvár and Keszthely, experiments on infection of a field with seeds of dodder (*Cuscuta suaveolens* Ser.). The conclusions obtained from these investigations are as follows:

Hungary

1. The presence of not more than three seeds of dodder per kilogram (2.2 lbs.) of seed of clover did not give rise to any centre of infection.

2. Consequently, according to the Author, red clover seed not containing more than three seeds of dodder per kilogram, may be used without hesitation for sowing.

3. The deep sowing of the seeds, *i. e.* 1 to 1 ½ inches below the surface of the soil, constitutes an effective defence against the appearance of dodder, even in the case in which the lots of seeds contain up to 10 seeds of dodder per kilogram.

4. It is therefore advisable, when the conditions of the soil permit, to sow the seed to a depth of at least 1 inch in the case of all those containing more than 3 dodder seeds per kilogram.

5. Many of the centres of infection of dodder formed during the first year of experiment were destroyed when winter came on.

6. The sowing of red clover at a depth of 1 to 1 ½ inches in light and rather loose soil does not in the least influence the development and yield of the plant. This practice therefore constitutes an important means of controlling *C. suaveolens* (and probably other species of dodder) for all those soils which allow of carrying out deep sowing.

7. The experiments made have brought out clearly the great diversity of behaviour of *C. suaveolens*: notwithstanding the fact that at Keszthely during the first year of investigation some centres of infection appeared, the field remained completely immune subsequently ; at Magyarovár on the other hand the centres of sporadic infection which appeared in the first year partly maintained themselves later.

8. The cutting of the cultivated plant carried out at the proper time also forms an effective means of checking the appearance of dodder.

1118 PLANCHON, LOUIS. ***Osyris alba*, a Phanerogam parasitic on Vine.** (Un nouvel ennemi de la vigne, l'*Osyris alba*). — *Le Progrès agricole et viticole*. 33ᵉ Année, No. 22, pp. 676-686, fig. 1-7, 1 pl. in chromo. Montpellier, 2 juin 1912.

France: Hérault

This member of the Santalaceae, reported in 1886 by J. E. Planchon as an accidental and almost harmless parasite of the Taylor vine in Gard, has been recently recognised as the cause of the withering and death of a number of Rupestris Monticola vines in the vineyards of Hérault, where the *Osyris* also, although less severely, attacks Riparia and Jacquez.

The vines only appearead diseased in the vicinity of the *Osyris* over an area of 3 or 4 rows, and the disease gradually spread, starting from the hedges enclosing the vineyards which had been the first centres of the parasite.

All the diseased vines carried the suckers of the parasite on their roots. They for the most part withered slowly and gradually, and the death of the plant took place 3 to 4 years from the development of the *Osyris*. There had first been observed weakening in growth and a falling off in the number of fruits; the vine had then assumed the appearance of one attacked by " court-noué ", some branches were dead and the surviving ones looked weak, and finally the entire stem died. Occasionally however the plant perished rapidly (in the year 1911): the stems had lost their leaves and taken on the appearance of those assailed by " folletage ", but the branches were not entirely withered, so that in autumn after the surrounding *Osyris* had been cut out, they began to grow again.

The presence of the *Osyris* causes the roots of the vine to dry rather than wither.

A young plant of Rupestris monticola put in the place of a dead vine was seen to grow poorly and speedily died; this likewise took place when other varieties were tried.

In any case it would be desirable to continue tests of this character, which are of interest to Southern grape-growers, *Osyris* being rather widespread in the Mediterranean region, where it grows on all soils and in all sorts of stations (in hedges, copses, underwood, roadsides, etc.).

WIEDERSHEIM, W. **Goosegrass or Cleavers.** (Die Bekämpfung des Unkrautes: V. Stück Das Klettenlabkraut [Kleber] [*Galium Aparine* L.). — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Heft 203, pp. 29 + Taf. 11. Berlin, März 1912. **1114**

Germany

Dr. Wiedersheim's pamphlet is a monograph on goosegrass or cleavers (*Galium Aparine* L.), treated specially as an agricultural weed; it contains very numerous references to other authors.

Life-history. — This plant is an annual and relies entirely on seed for its propagation; the writer failed to get any growth from cuttings. The number of seeds it produces is small compared with that in many weeds (*e. g.* poppy and shepherd's purse), normally between two and six hundred.

In testing the power of germination of the seeds, Dr. Wiedersheim got no germination with the ordinary appliances, nor on the surface of sand, sawdust, peat or loam, and this result was unaffected by light or darkness and variations of temperature. In soil, germination generally proceeded for about a month, after which a considerable percentage of sound, but ungerminated, seeds often remained. Experiments on depth of sowing showed an average germination of 75 % at 5 cm. (2 in.), 53 % at 10 cm. (4 in.), 15 % at 20 cm. (8 in.), and none at 40 cm. (16 in.). Different soils gave:

Garden earth.	90 %
Loamy arable soil	80 %
Leaf-mould	70 %
Peat-mould	70 %
Sand	70 %
Sawdust	20 %

The seeds seem not to require a resting period, for even unripe seeds can germinate at once; thus a series carried on for 32 days gave:

Small green seeds	3 %
Large green	13 %
Greenish-brown	62 %
Yellowish-brown (quite ripe)	76 %

The duration of the germination capacity has not yet been determined: seeds three years old have given 50 to 70 % of germination.

Seeds capable of germinating may be found before the end of June, and a second generation may occur in the season, though this is quite exceptional.

Damage to Crops. — Goosegrass is harmful to corn crops chiefly by increasing their liability to lodge and in retarding the drying of the sheaves owing to its green shoots in the butts.

The seed is liable to cause trouble in grain, as its minimum dimensions are nearly the same as those of wheat; some measurements made were: wheat, length 8-10.3 mm., width 2.6-3.2 mm.; cleavers, diam. 2.2-3.3 mm.

Cleavers being an annual which germinates readily in autumn, is best dealt with by preparing a seed-bed for it immediately after harvest, and then turning under the seedlings.

Dr. Wiedersheim has tried the effect of spraying ferrous sulphate, nitrate of soda, sulphate of ammonia, and muriate of potash on goosegrass growing in corn, but none of them has given satisfactory results: even plants in which all the green parts were killed by dipping into 20 % ferrous sulphate solution sprouted again from the main stems.

Goosegrass is particularly favoured by winter-corn; where autumn-cleaning and then roots follow winter-corn it does not increase; but where unhoed corn follows potatoes (or an insufficiently cleaned root-crop) it may increase to a great extent. With seeds sown under spring-corn, it does not produce much seed, but what is dropped remains to grow after the ploughing-up of the lea, so that in that case it is better not to take a winter corn-crop.

INSECT PESTS

MEANS OF PREVENTION AND CONTROL.

Beetles parasitized by Laboulbeniaceae. — See above, No. 1102. **1115**

FRENCH, C. (Junior). **Insectivorous Birds of Victoria** (1). **The White-headed Stilt** (***Himantopus leucocephalus***, **Gould.**). — *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. X, Part 4, pp. 258-259, 1 fig. Melbourne, April 1912. **1116**

Australia: Victoria

During the months of October to December 1911, the White-headed Stilt (*Himantopus leucocephalus* Gould.), a bird known as a destroyer of injurious insects and fresh-water snails, nested near Laverton, on the Geelong line. This is perhaps the first reliable record of its presence in Victoria. The birds had made their nest in the centre of a marsh, using for the purpose portions of various aquatic plants. Before all the eggs were hatched, however, the marsh began to dry up; the adult birds emigrated, leaving a number of eggs and young.

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(1) See *B.* May 1912, No. 870. (*Ed.*).

1117 DULL, H. L. **Control of the Potato Moth (*Phthorimaea operculella*)** (1) **in Bengal.** (Communicated by W. B. Heycock, Director of Agriculture, Behar and Orissa).

British India: Bengal

During the month of April 1912 the Entomological Section was busy making arrangements for combating Potato Moth (*Phthorimaea operculella* Zell.) affecting potatoes. The pest first made its appearance in the Patna district in 1907, but since 1911 it has been spreading fairly rapidly over the whole province. At first it used to attack the tubers stored in the godown after harvest, but this year damage to the tubers is evident in the field. By experiments conducted for three successive years at Patna, it has been found out that the damage can be entirely avoided by storing the tubers under dry sand, as in that case the moths cannot lay eggs on the eyes of the tubers. In order to popularise the method, godowns have been rented in different important divisional centres and the proper method of storing demonstrated. Intelligent cultivators are taking up the method promptly. In many places potato cultivation is being abandoned for fear of this loss.

1118 POLLACCI, EGIDIO. **Two Efficacious Methods of Controlling the Japanese Fruit Scale (*Diaspis pentagona*) and other Parasites.** (Di due metodi teorico-pratici semplici, economici ed atti a liberare l'agricoltura dalla *Diaspis pentagona* e da altri insetti). — *Reale Istituto Lombardo di Scienze e Lettere, Rendiconti*, Serie II, Vol. XLV, Fasc. VII, pp. 336-342. Milano, 1912.

Italy

The writer suggests two very economical and efficacious methods for killing *Diaspis pentagona* and other parasites quickly, without harming the plant. The latter indeed is immune from fresh attacks for more then two years, on account of the thin layer of mineral substance which is deposited on its surface.

The formula of the first remedy is as follows:

Well-preserved chloride of lime	12 lbs.
Water	10 gals.
Powdered permanganate of potash	$^1/_8$ lb.

The liquid should be kept in closed receptacles and it is well to shake it before use. The best months for using the insecticide are December, January and February; couch-grass brushes are better than those of horse-hair for applying the mixture.

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(1) See *B.* April 1912, No. 749. *(Ed.)*.

The formula of the second remedy is as follows:

Milk of lime (very weak)	100 gals.
Caustic soda (in sticks)	2 lbs.
Powdered permanganate of potash . . .	1 lb.

This liquid is kept and used like the first. But it must not be forgotten, that it is very caustic and attacks and corrodes hair brushes and those made of vegetable substances; metal brushes resist its action, but they must be made of wire neither too rigid nor too yielding.

The first remedy is a little more expensive; but the surfaces of the plants are made almost clean and it is to be hoped that it will be efficacious not only in the control of *Diaspis*, but also in that of other injurious parasites.

The other mixture, though more economical, in every case stains the surfaces of the plants and is possibly not so quick-acting as the first-mentioned insecticide. Thus it appears that preference should be given to the preparation based on chloride of lime.

INSECTS AND OTHER INVERTEBRATES INJURIOUS TO VARIOUS CROPS.

WEBSTER, F. M. **The So-called Curlew-Bug (*Sphenophorus callosus*).** — *Papers on Cereal and Forage Insects: U. S. Department of Agriculture, Bureau of Entomology, Bulletin*, No. 95, Part IV, pp. 53-71, plates VI-IX, figs 16-21. Washington, April 10, 1912. **1119**

Sphenoporus callosus is known popularly as the " Curlew-bug "; " Klew ", " Clewbug " and " Kloobug ".

United States

Its centre of abundance is in eastern North Carolina, whence it extends southward to southern Florida, northward to Maryland, thence northwest to northwestern Illinois, southwest to extreme south-eastern Arizona and northern Mexico, and eastward to the coast of the Gulf of Mexico.

It is essentially an insect of low-lying ground, as is shown by its host-plants; therefore it especially interests the farmer whose land is situated in marshes, etc., and consists of low alluvial soil.

The host-plants are: *Cyperus strigosus, Tripsacum dactyloides, Carex vulpinoidea, Cyperus esculentus, Panicum capillare, Carex Frankii, Cyperus rotundatus, Cyperus esculentus*, and, amongst cultivated plants, maize, rice and earth-nuts.

Rice is the plant which suffers most from the attacks of this insect, but as it is far less grown than maize, the damage caused to the latter plant is the more important matter for consideration. The adult insects lay their eggs in June and September in crevices, which they make in the roots just below ground, or a little higher up on the stem. The larvae, which are almost similar to those of *Sphenophorus maidis*, require from 37 to 41 days to develop. The pupal stage lasts 9 days at the minimum.

Some of the adult insects appear to hibernate in the cavities which they made in the maize, and where they have developed, and a little lower than *Sphenophorus maidis;* others probably pass the winter at, or near, the surface of the ground. They leave their winter quarters in the spring when the soil is again warm.

Both adult insects and larvae attack the maize, but the damage caused by the latter is by far the more serious. They excavate galleries at the base of the stem and in the main root, thus considerably hindering the plants' development. The adults perforate the base of the plant, and thus obtain juicy, succulent food. Their attacks are shown by the withering of the plant, by an unusual growth of shoots and by the absence of ears and the perforated condition of the leaves.

The only two methods of control which have proved efficacious are the destruction of all the host-plants and the avoidance of planting rice or maize in rotation with the latter.

Hilling up the plants, by raising the level of attack of the adult insect, though enabling the plants to resist better, is not a radical remedy.

Sphenophorus callosus has been found in the stomach of one bird, — a Nighthawk (*Chordeiles acutipennis texensis*).

1180 MOREIRA, CARLOS. ***Pieris monuste*, a Pest of Cultivated Crucifers.** (Uma praga das hortas). — *A Fazenda*, Anno III, No. 21, pp. 2-3, fig. 1-8. Rio de Janeiro, fevereiro 1912.

Brazil Serious damage is caused to the crucifers grown for food purposes in Brazil by *Pieris monuste* L., a butterfly common in the southern parts of North America, in the West Indies and in Central and South America, where it is found from sea-level up to an altitude of 1500 metres (5000 ft.).

The female deposits her eggs chiefly on the under sides of the leaves. Four or five days later these eggs begin to hatch and the caterpillars begin their work of destruction of the leaves of the host plants, continuing it for 20 to 25 days.

In the event of extensive invasions by the insect it is advisable to use an emulsion of soap and kerosene; usually it suffices to hunt the caterpillars direct and destroy them by burning.

1121

Mc Gregor, E. . **The Red Spider (*Tetranychus bimaculatus* otton.** — *U. S. Department of Agriculture, Bureau of Entomology, Circular* No. 150, pp. 13, figs. 5. Washington, April 25, 1912.

United States

The red spider made its appearance in the summer, and a generation reached maturity in from 10 to 11 days. In S. Carolina, there are probably about 15 generations in the course of the year. The colonies live on the lower surfaces of the leaves of the cotton plant and their constant attacks cause blood-red patches on the extremity of the leaves. The infected leaves fall, one by one, till the plant itself dies. The pest increases, and rapidly multiplies during times of little rainfall and high temperature. Fortunately, its ravages are checked by many parasitic insects: *Triphleps insidiosus* Say, *Euthrips fuscus* Hinds. and *E. occidentalis* Pergande, *Scolothrips sexmaculata* Pergande, etc.

At the end of the period of growth of the cotton plant, the red spiders migrate to greener plants and choose especially the cultivated violet.

Methods of Control.

1. Burn, or remove all weeds and underbrush about cotton fields and practise fall ploughing as far as possible.
2. Spray, or destroy, all suspected violet plants.
3. Thickly sow cotton along margins of fields, where infestation has appeared on former occasions and plough these in about June 1.
4. Maintain a careful watch over the fields, so that the first plants attacked may be detected, removed and burnt, thus preventing further spread.
5. Apply one of the insecticides before occurrence becomes too general.

Two applications should be made; the first to destroy the living insects, and the second a week later, to kill the recently hatched individuals, which were unhatched at the time of the first spraying.

The opinion will be ventured that the red spider is not a difficult pest to combat, especially as it is wingless, and thus cannot migrate far from its winter quarters, to which attention must be paid.

1122 CHITTENDEN. F. H. **A Little-known Cutworm (*Porosagrotis vetusta*).** — *Papers on Insects Affecting Vegetables: U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No. 109, Part IV, pp. 47-51, fig. 8. Washington, April 5, 1912.

United States

Porosagrotis vetusta Walk. is a moth of which the larvae seem to feed upon every green thing,— vines, peach-trees (of which they devour the leaves and buds), tobacco plants, cotton, cabbages, beans, melons, parsley, etc.

This insect is met with throughout the whole State of New York; but the species seems to include several varieties, which occur in the following States: Washington, Colorado, Arizona, California, British Columbia, Virginia, N. Carolina.

It is chiefly since 1900 that complaints have been made of the damages caused by this cutworm. The best remedy is arsenate of lead used in the proportion of 4 lbs. to 50 gals. of water. This species has doutbtless many natural enemies; but the only ones at present known are: *Apanteles* n. sp. (near *A. agrotidis*) and *Linnaemya picta* Meig.

1123 PASSY, PIERRE. **Pear Case-bearers (*Coleophora hemerobiella* and *C. flavipenella*).** (Les Teignes du Poirier [*Coleophora hemerobiella* et *C. flavipenella*]). — *Journal d'Agriculture pratique*, 1912, Tome I, No. 22, pp. 691-693, fig. 113-118. Paris, 30 mai 1912.

France

In spring and summer, small brown projecting bodies are often observed, which are fixed almost perpendicularly on the leaves and fruits of the apple and pear tree. These are the protective cases of the larvae of *Coleophora hemerobiella* and *C. flavipenella*, two moths which sometimes do much harm to the trees.

When the larvae confine themselves to devouring the leaf parenchyma at the spots where they are affixed by their cases, they do not effect usually much injury. But the case is otherwise when the insect affixes itself directly to the fruit. The wounds in the flesh heal over quickly, but the value of the fruit is depreciated, especially in the case of dessert apples and pears; this loss occurs some years in Brittany.

The methods of control are not easy of application, owing to the presence of the larval cases. Nevertheless, if the insecticide is sprayed in sufficient quantities, and the liquid is absorbed, some of it reaches the head of the caterpillar and destroys it. Spraying is especially recommended at the moment of the hatching out of the eggs and of the appearance of the moths. Cleaning the trees in winter, and washing them with a sufficiently strong and penetrating insecticide is also very efficacious.

The writer advises the trial of the following formulae:

1) Water	10 gallons
Carbonate of soda	1 lb.
Fish oil	2 lbs.
Crude petroleum	9 »
2) Coal-tar oil	1 part
Lime	1 »
Water	1 »

Lime-sulphur, or fumigations with sulphur or with hydrocyanic acid, can also be used.

BLIN, HENRI. **The Scales of Fig and Orange.** (Les cochenilles du Figuier et de l'Oranger). — *Revue horticole*, 84e Année, No. 9, pp. 201-203. Paris, 1er mai 1912. **1124**

In variour parts of Provence, at Nice, Cannes, Golf-Jouan, and likewise at Toulon, Hyères and in the territory of Marseilles, considerable invasions of the fig and orange trees by the scale or "kermès" are reported. **France**

In order to limit the spread of this insect, energetic measures of control require to be taken during winter. One of the first precautions consists in removing by careful pruning all the branches most severely attacked by the scale and covered by the fumago accompanying it.

Insecticides are also used; hitherto the following formulae have given excellent results:

a) Carbonate of soda	1 lb.
Fish oil	2 »
Crude petroleum	9 »
Water	10 gallons

(Brushed or sprayed on in winter).

b) Solutions of carbonate of nicotine (3 % strength in winter, 2 % before the blossoming time).

c) Concentrated nicotine (supplied by Government) . . . . **$^4/_5$ pint**

Concentrated nicotine (supplied by Government)	**$^4/_5$ pint**
Methylated spirit	**$^4/_5$ pint**
Black soap	**2 lbs.**
Water	**10 gallons**

This mixture is used for spraying the leaves in April and May at the time of opening.

Independently of the insecticides the plants should be strengthened by supplying them, likewise in winter, with plentiful manure, *e.g.* from 18 to 22 lbs. per plant of a manure composed of 3 to 4 % of nitrogen obtained from calcined horn, 5 to 6 % of soluble phosphoric acid in the form of superphoshate, and 2 to 3 % of potash in the form of sulphate of potash. For soils rich in organic substances a manure may be employed made up of 2 to 4 lbs. of sulphate of ammonia and 9 to 11 lbs. of potassic superphosphate for each plant.

In the region of Nice and likewise at Golf-Jouan and Cannes the oranges are especially attacked by *Chrysomphalus minor*. This is controlled like the other orange scales by means of solutions of soap and petroleum, soap and carbon disulphide, lysol and nicotine. Petroleum emulsion becomes very effective if methylated spirit is added to the soap. These remedies must be applied every 8 to 15 days until complete disappearance of the scales.

For plants in pots the action has been tried of carbon disulphide vapours; 1 $^1/_5$ oz. of the substance to 10 cubic ft. is sufficient to destroy the scales in 15 hours; 1 $^4/_5$ oz. suffices for a treatment in 5 hours and 3 oz. in 3 hours.

In America, as is well known, recourse is had to the natural enemies of the scale (*Vedalia cardinalis* and *Nectria* sp. against *Icerya Purchasi*).

The Author finally recommends protecting small birds, which are great destroyers of scales.

1125 **Scale Insects injuring Limes in St. Lucia.** See above, No. 1049.

ALFREDO RUGGERI, *Gerente Responsabile.*

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The Canadian abstracting is by Mr. T. K. Doherty, chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of June and July 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

HITIER. **Australia: Development of its Agricultural Production.** (Notes d'agriculture). — *Bulletin de la Société d'encouragement pour l'industrie nationale,* III Année, I Semestre, No. 5, pp. 720-738. Paris, mai 1912. 1128

Australia presents a particular interest to all engaged in agriculture or industry because like the Argentine republic, it is one of the greatest sheep countries of the world and its wools supply the raw material for a great number of factories. Thus of the **Australia** 1 135 115 tons of wool absorbed by the mills of the whole world, Australia appears to have supplied 381 195 tons as against 193 050 produced by la Plata and Uruguay and 191 512 tons by the whole of Europe.

Australia besides does not export to Europe only the wool of its sheep. Their carcases, either frozen or refrigerated, are in increasing demand owing to the high prices of meat in the old countries, and though Australian meats are but little consumed in France, they form an important item in the meat supply of the British workman,

Australia exports to Enrope also ever increasing quantities of wheat; its production however does not exceed 69 to 83 million bushels in good years. Butter, wine, and fruits are also among the exports of Australian agriculture.

The new "Dry Farming" processes, as well as the great irrigation works and the boring of artesian wells recently carried out in Australia, contribute also to increase the quantities of agricultural produce for exportation, and the high prices of many of these commodities are well calculated to stimulate both Governments and private citizens to invest considerable amounts of capital in land improvements and in the better management of the soil.

The Australia Commonwealth embraces today the whole continent of Australia; a territory equal in extent to $^4/_5$ of Europe, and peopled by only 4 ½ million inhabitants, but capable of supporting a much greater a number. The value of its exports exceeded in 1911 £140 000 000. Australia is thus a new country, in which upwards of 988 millions of acres of land are still unoccupied; and yet the problem of immigration exists in a more acute form than in the United States, Canada or the Argentine.

Australia requires hands, and yet until quite recently a series of laws and of restrictive measures, especially since 1901, formed a barrier against the entry into Australia of whites as well as of men of colour.

The *natural conditions of the Australian continent*, formed by a series of plateaus presenting an uneven and broken surface with a desert character, have caused the current of colonisation to extend along the coast for immense distances, while advancing but very slowly towards the arid interior of the country.

The discovery of gold contributed powerfully to the progress of Australia, and yet today, as before 1851, it is the production of wool which forms the basis ot the economic prosperity of Australian colonists. The prevalence of pastures over field crops is the direct consequence of the nature of the soil and of the climate.

After the drought which lasted in Australia from 1897 to 1903 the flocks had diminished by more than half their number of heads. In 1904 they began to increase again, but they have not yet reached the status of 1892. Nevertheless the yield of wool is improving every year. But farming proper gradually takes possession of pasture lands, and of the best of them, and the pastoral industry is driven towards the interor, to that hinterland which becomes more and more arid in the direction of the centre of the continent. A limit is being approached beyond which the distance from the sea ports and wool-marts and the aridity of the climate will render sheep rearing unprofitable. Nevertheless, according to official estimates it appears that the grazing territory when improved by the projected costly irrigation schemes will be capable of providing for upwards of 300 million sheep.

All the *agricultural policy* of Australia is based on this rivalry of interests between grazing and farming proper. But it is not the land that is wanting in Australia, and the agricultural policy wiil have to become a "water policy" because the water problem is the most important of all the problems the Australians have ever had or will have to face.

The *water problem* exists only for the Murray basin, but it is of vital importance for 409 000 sq. miles of land belonging to the four States: N. S. Wales, Queensland, Victoria, and S. Australia.

In the Murray basin the irregularity of the distribution of water is extreme. Droughts are the curse of the interior of Australia, and they cannot be successfully controlled except by the proper management of the rivers and by the boring of artesian wells.

For the improvement of the rivers barrages have been built both in the mountains and in the plains, and the lakes also have been attended to. The whole legislation on water is based on the principle that as soon as water concerns more than one person it becomes public property. At the same time all transgressions in matters concerning water are punished with exceptional severity.

As for *artesian wells* it will be sufficient to recall that in 1906 their yearly output in the Murray basin was estimated at about 38 000 million cubic feet. It is principally by means of *irrigation* that the desert regions are conquered step by step and the great fertility of the " Red Soils " and especially of the " Black Soils " rendered available. The latter may be classed among the best lands of the world, only wanting water to reveal their wealth.

The development of irrigation may be measured by the fact that 21 trusts possess 2 598 450 acres on the Victoria tributaries of the Murray, and that they irrigate, by means of 1764 miles of canal, an area of 289 000 acres.

Australia produced in 1910-1911 82 530 000 bushels of wheat. Market gardens are to be seen at all the stations, and the orchards are the most evident signs of the success of irrigation in Australia. All kinds of fruit trees, planted as in California in long avenues alternating with channels of running water, give an abundance of fruit, perhaps of no great flavour, but of handsome appearance.

Cold storage ships convey the exports to London, where the sale is all the more remunerative as the produce arrives during the winter season.

These brilliant results allow of somewhat exaggerated hopes as to the future being entertained, but they justify the prevision of a slow transformation and a notable development of real colonisation, that which is based upon the small farmer; and the characteristic of this evolution will be especially the increase in the numbers of this class of men.

The Development of Agriculture in New Caledonia. (La Situation économique de la Nouvelle Calédonie et dépendances en 1911). — *Bulletin de l'Office Colonial*, 5^e Année, No. 53, pp. 167-177. Melun, mai 1912. 1127

New Caledonia

For some years, improvement and progress have been noticed in the agricultural colonisation of New Caledonia; the yields of crops increase yearly.

But, in order that this progress may continue, cheap and rapid methods of communication are necessary for agriculture.

In 1911, the general foreign trade of the country amounted to 27 901 546 fr. (£1 107 200) with an increase of 5 580 860 fr. (£221 450) on the preceding year. The year 1911 was the most prosperous, showing an advance of 2 232 142 fr. (£88 575) on 1902, at which date the exports and imports had reached their maximum. The exports were worth 3 013 909 fr. (£119 600) more than those of 1910. This increase was partly due to coprah, 404 000 fr (£1 600), and raw cotton, 59 000 fr. (£2 340), among the agricultural products. The export of parchment coffee, which in 1910 was 519 tons, rose in 1911 to 648 tons.

The coffee plantations continued to yield excellent crops in 1911, in spite of the appearance of *Hemileia vastatrix* on nearly all the estates. This pest was controlled by spraying with Bordeaux mixture, and replanting the plantations with *Coffea robusta* from Java.

Large extents of land are still available for the cultivation of coconut trees to supply the increasing demand for coprah for exportation. Some rubber trees have also been planted.

The experiments in growing rice on dry or nearly dry ground have been very satisfactory; while cotton cultivation is being developed at different places in the colony, and the exportation of live cattle has begun.

Numerous industries could with advantage be created for the transformation of the products of agriculture and cattle raising. The factory for tinned meat at Ouaco has produced this year the same output as in the preceding year; it has been working all the time. The two scent factories of Nouméa and Ouaco have not been working; this industry in still in its infancy.

At Nouméa, a steam drier with silos for grain and two factories for ginning cotton are in regular work. The rum factory at Saint-Louis only distils intermittently.

1128 GOULVEN, J. **The Products of the Ivory Coast.** (Ce que produit la Côte d'Ivoire), — *Bulletin mens. de la Soc. de Géographie Commerciale de Paris,* Tome XXXIII, No. 5, pp. 315-322. Paris, mai 1912.

Ivory Coast

In a rapid review of the products of the Ivory Coast, the author shows the increasing importance of this French colony, especially since it has been realised that its climate is not more unhealthy than that of other tropical regions in Africa or in Asia. The author enumerates the riches of the forest belt which occupies the whole of the lower Ivory Coast, and constitutes an immense reserve of produce for exportation, chief among which are palm oil and kernels, rubber, cacao, timber and other products susceptible of development. The utilisation of oil palms, on the initiative of the administration, has been successfully improved by the introduction of palm-nut crushers; the natives, struck by the advantages obtained by the use of machinery, and without having recourse to middlemen, order directly crushers and presses. The development of the native palm-oil industry is besides stimulated by the good prices its produce commands. The exportation of palm-nuts attained in 1911 the value of £63 016, representing 5 179 tons, while 6 521 tons of palm oil, valued at £161 106, were exported.

The exportation of rubber has, during the last 15 years, occupied the most prominent position in the Ivory Coast trade. The strips and thin and transparent sheets represent a form free from foreign bodies and are eagerly sought for. The ports of Lassandra, Dom Pedro, Tabon and Poliézon exported in 1911 2 785 120 lb. of rubber worth £ 392 042.

The cultivation of cacao, which began in 1908, has developed rapidly. The exports of cacao rose from 53.5 cwt. in 1908 to 295.5 cwt. at the end of 1911. A Decree of Nov. 16, 1911 remits one half of the customs duty, and the present price of cacao (£80 12*s*. 9*d*. per ton) is a further encouragement for planters.

But it is especially owing to its timber that the Ivory Coast has conquired its position in all the great markets of Europe and America. Its very dense forests offer an inexhaustible wealth of trees of all kinds, most of which attain a height of 160 feet. The rarest and the most precious woods are found in these forests: mahogany, sandal wood, acacia, teak, raphia, palms etc., and in great quantities. The amount of squared timber obtainable per acre seems to be not less than 715 cub. feet.

Calculating the extent of forest to be 15 millions of acres (some say twice as much), an idea may be formed of this immense natural wealth and it will be easily understood that it has attracted the attention of the trade. The exports of timber from the port of Grand Bassam alone rose from £23 800 in 1899 to £99 000 in 1910.

Besides the above elements of prosperity the colony produces coffee, kola nuts, piassava, coprah, etc.

1129 CHUDEAU, R. **The Agricultural Resources of Mauretania.** (Les Ressources agricoles de la Mauritanie). — *Bulletin mensuel de la Société de Géographie Commercia'e de Paris,* Tome XXXIII, No. 5, pp. 305-314. Paris, mai 1912.

Mauretania

Mauretania comes under two types of dry climate: in the north is the Sahara where rain is only occasional; in the south there is a regular rainy season (June to October); going from south to north the yearly rainfall changes from 250 mm. (10 in.) to nothing (Sahelian zone). It is nowhere by itself sufficient for the growth of food crops.

The products obtained in the various parts of Mauretania are chiefly Kaffir corn, cowpeas, water-melons, barley, durum wheat, tobacco (*Nicotiana rustica*), and shallots. The only trees grown in the oases are date-palms. Everywhere the crops are irregular, and the prices of agricultural produce vary greatly with the season. Only the growing of date-palms gives regular results, at the same time being more laborious.

In studying the oases of Mauretania it is readily seen that the Moors have utilised every available spot for planting date-palms, so that it is not likely that many fresh groves can be started. Each palm gives about 75 lbs. of dates, bringing in about 24*s.* a year. The oasis of Atar produced 2 000 tons in 1910, and the oasis of Chinguetti 1 000 tons. At Tidji-Kdja there are about 4 000 palms, about half being in full bearing. Some hundreds of palms were planted in 1911.

There seems some prospect that other crops (such as beets, egg-plants, tomatoes, apricots, vines) may be introduced and adopted by the natives, and that the old crops may be improved by selection and the use of good varieties from Marocco and Algeria.

The most important natural product is undoubtedly the gum from Senegal acacia; this tree can only be utilised in Trazza and Brakna. The trade in this gum used to be important, but had fallen off owing to the competition of dextrin; it is, however, recovering at present.

Live-stock breeding is relatively flourishing; goats and hairy sheep are found everywhere; zebus are fairly abundant, as well as small and hardy horses; donkeys are everywhere numerous.

The Author concludes that the economic value of Mauretania is small, and cannot increase much; these regions will never play an important part in West African commerce. For a long time the trade in negroes and in salt have added to the meagre resources which the people obtain from crops and cattle.

RURAL HYGIENE.

FUNK, CASIMIR. **The Etiology of the Deficiency Diseases. Beri-beri, Polyneuritis in Birds, Epidemic Dropsy, Scurvy, Experimental Scurvy in Animals, Infantile Scurvy, Ship Beri-Beri, Pellagra.** — *The Journal of State Medicine*, Vol. XX, No. 6, pp. 341-368. London, June 1912. 1180

The diseases mentioned above present certain general characters which justify their inclusion in one group, called deficiency diseases, as they are caused by a deficiency of some essential substances in the food. Although this view is not, as yet, accepted by all, it is shown to be correct by an examination of the results of the last twenty years of experimental work.

This article is written with the intention of giving a summary of the modern investigations, and by means of a careful selection of references, of facilitating the study of the original literature. Reference is made to 94 works and the writer gives an account of his own experiments.

The deficiency diseases break out in countries where a certain unvarying diet is partaken of for long periods. They all present the following general characters: general cachexia with an enormous loss of weight; often marked nervous symptoms (due probably to degeneration of the peripheral nervous system).

It is now known that all these diseases, except pellagra, can be prevented and cured by the addition of certain substances, called by the writer «vitamines», which are of the nature of organic bases. The above-mentioned diseases are divided by Dr. Funk into two different groups, those of beri-beri and scurvy. The investigations on pellagra however have not yet resulted in a sufficient elucidation of its etiology to establish it as a deficiency disease, and it is included here provisionally, owing to its similarity in some respects to the other diseases mentioned.

The Beri-beri group is characterized by more or less distinct neuritis symptoms; to it belong beri-beri, polyneuritis in birds and epidemic dropsy. Beri-beri occurs in countries such as Japan, the Malay States, the Philippine Islands, Indo-China, where rice is used as a staple diet; it must, however, be eaten for long periods (six or seven months) to produce the disease. Symptoms of beri-beri are: loss of weight, often accompanied by oedema, contractions, paralysis and anaesthesia in the limbs; sometimes degeneration occurs in the nerves and heart. The disease, in most of the acute cases, terminates fatally.

Wernich and van Leent have suggested a causal connection between beri-beri and an exclusive diet of rice. Acting on these ideas, Takaki was able, by a change of diet (addition of meat) to practically eradicate this disease from the Japanese navy. Eykman and Vordermann came to the conclusion that the disease has a distinct connection with the continuous consumption of decorticated rice (*i.e.* rice deprived of the pericarp, epicarp and the outer part of the grain which is rich in nitrogen) but does not occur when parboiled rice is used (*i. e.* when the pericarp alone is removed). These results were confirmed by other investigators.

Eykman further showed that birds (fowls, pigeons, ducks) when fed on polished rice developed a disease very similar to beri-beri and which he called *polyneuritis gallinarum*. He also found that it was not possible to induce the disease with rice containing the pericarp or that part of the pericap which is called the silver-skin by the Dutch writers (1). Eykman arrived at the conclusion that starch produces in the intestine a substance which acts as a poison on the nerve-cells, and showed that the silver-skin is richer in nitrogen than any other part of rice and contains an antidote for the starch poison. Gryns found similar protective substances in *Phaseolus radiatus* and meat and showed that these foodstuffs lose their protective power when heated to 120° C. Schaumann found a similar protective substance in yeast.

The principles wanting in a diet giving rise to beri-beri are, according to various authors, phosphorus or phytin or salts, especially potassium salts.

The protective substance is soluble in water, in alcohol and in acidulated alcohol. It is dialysable and is destroyed by heating to 130° C. and is neither a salt nor a protein. The writer succeeded in isolating it from the residuum of decorticated rice, by extraction with acidulated alcohol, distillation of the solvent *in vacuo* ; extraction with water ; precipitation with phospho-tungstic acid; removal of the choline and precipitation by means of silver nitrate and baryta. By the decomposition of the silver salt, a substance melting at 233° C. and with the formula $C_{17} H_{20} N_2 O_7$ was obtained. This compound proved to be curative and was named by the writer provisionally beri-beri vitamine Its unsaturated nature would explain very well its physiological instability in heating experiments.

The yield of vitamine was extremely small. From 1 kg. of polishings only ½ gr. of crystalline substance was obtained.

(1) Cf. *B*. Jan. 1912, No 172. (*Ed.*).

The dose of crystalline vitamine necessary for curing pigeons was very small (Schaumann considers it acts only as an activator, and not as a food) and 40 mgr. was not only sufficient to cure a pigeon in three hours, but also maintained the cured bird in health for periods varying from seven to twelve days when polished rice was used as a food.

By the same method, the writer obtained bodies capable of curing beri-beri from milk, yeast, ox-brain and lime-juice. The cures with fractions obtained from ox-brain were so unexpectedly quick, that it seems possible that the substance contained in brain is ready for use. Similar substances are present in vegetables, cereals and meat, and it is interesting to note that vitamine can be extracted from all of these by means of alcohol.

Judging from the manifest nervous symptoms, the fatty degeneration in the nerve cells, and the above-mentioned chemical changes (loss of nitrogen and of phosphorus) Dr. Funk thinks that vitamine is necessary for the metabolism of the nervous tissue. Lack of vitamine in the food forces the animal to get this substance from its own tissues. The result is enormous loss of weight. After this available stock begins to be scarce, there is a consequent breaking down of the nervous tissue, with the result that nervous symptoms, such as are observed in beri-beri, manifest themselves.

Epidemic dropsy, which occurs in India, seems, according to the investigations of Grieg, to be due to the same cause as beri-beri.

The characteristic symptoms of scurvy are anaemia, a general cachexia, a marked tendency to local haemorrhages and haemorrhagic inflammation. Sometimes it is accompanied by the neuritis and anaesthesia of the limbs characteristic of beri-beri.

It is now generally accepted that scurvy is caused by a diet consisting chiefly of starch, bread and tinned preserved food. The remedy consists in good dietetical conditions, lime-juice, fresh fruits, and vegetables, especially onions.

Holst and Fröhlich, experimenting on guinea-pigs, rabbits and dogs, and Schumann especially on monkeys and dogs, were able to produce scurvy in animals fed on the same food which caused this disease in man. As protective food in the experiments of Holst and Fröhlich, fresh potatoes, apples, lime-juice, carrots, cabbages and dandelion leaves were used. Only fresh food possesses this prophylactic power; if boiled or dried, it is useless. Cabbage heated to 110° C. is no longer efficacious, and the juice obtained by pressing the cabbage was inactivated even at 60° or 70° C.; the same occurs if the juice is kept for a couple of months, even with the addition of antiseptics. Lime-juice is, however, much more stable ; it is not destroyed even after boiling for one hour, but it is poorer in vitamine.

Fürst describes a series of experiments in which he tried the effect of food yielding an alkaline ash (it was often stated that scurvy is the result of a special kind of acidiosis). This food failed to prevent scurvy, as did the addition of yeast. Grains, such as oats, which are known to prevent beri-beri, develop an antiscorbutic agent after they have been germinated ; they lose this power when they are dried again, and in the presence of moisture develop the scurvy vitamine.

The writer has tried to isolate the scurvy vitamine from lime-juice cleared by precipitation with lead acetate ; the filtrate evaporated *in vacuo* was precipitated with phospho-tungstic acid. From the phosphotungstate precipitate two fractions were obtained by means of silver nitrate and baryta.

The chemical investigation of vitamine and the experiments on its efficacy are not yet finished ; nevertheless, the results obtained lead the writer to think that scurvy vitamine is different from the beri-beri vitamine, although chemically belonging to the same class of substances.

From the investigations of Nocht and those of Holst and Fröhlich, it appears that ship beri-beri is produced by the same causes as scurvy.

Infantile scurvy breaks out in children fed on sterilized milk, with or without the addition of different flour preparations. Its symptoms are similar to those of adult scurvy, hence some writers have concluded that the two diseases are identical and caused by a deficiency of nutritive salts, especially potassium and iron. The patients can be cured by an addition to the food of unboiled milk, or of lime- or other fruit-juices.

According to Neumann (whose view is supported by others) boiling produces toxic substances in milk. Bordas and Raczkowski have found that lecithin is partially destroyed during the boiling of milk ; even at 60° C. a fair amount disappears, at 95° C. 28 per cent, and after heating for half an hour at 105° to 110° C. as much as 30 per cent is destroyed. Fröhlich found that pasteurized milk (heated at 70° C.) prevents scurvy, and milk heated for ten minutes at 98° C. loses its protective power completely. Some preliminary experiments done by the author demonstrated the presence of beri-beri vitamine in milk ; but not that of scurvy.

The vast amount of evidence suggests that the real physiological difference between the raw and boiled milk is not in the destruction of enzymes, antibodies and changes in proteins, but in the content of vitamine. The scurvy vitamine in the milk seems to be a fairly stable one ; it is however destroyed at 120° C. Unboiled milk is a food which provides all the constituents necessary for the growing organism and must therefore contain all kinds of vitamines.

Between beri-beri and scurvy a close analogy undoubtedly exists ; the common cause in both is a deficiency in diet, but a difficiency of two different substances. Beri-beri vitamine is a much more stable substance than scurvy vitamine. Different foodstuffs, like yeast, oats and barley (unhusked), which are known to prevent beri-beri and polyneuritis, are unable to prevent scurvy· Grains develop the scurvy vitamine during germination ; this fact suggests that the latter can be formed by enzyme action from the beri-beri vitamine, which is undoubtedly present in these seeds. The animal organism is not able to perform the slight change which is brought about by enzyme action in the grain ; thus it is obvious, that the anti-scurvy substance must be supplied as such by plants. The organism is incapable of transforming beri-beri vitamine into scurvy vitamine, though the opposite reaction is possible.

The investigation of pellagra moves now essentially on bacteriological lines. It differs from the preceding diseases, in that it cannot be produced experimentally in animals (1). Pellagra, which was known in Italy in the eighteenth century, now occurs in Italy, Rumania (2), Austria, Spain, Portugal, Egypt, Algeria, United States, Mexico and Central America ; it is strictly limited to districts where maize is used as the staple diet. The disease, which breaks out mostly in spring and autumn, shows nervous and psychic symptoms and leads often to general cachexia, diarrhoea, and suicide. A very characteristic symptom is an erythema of the skin, which is caused by the sun and is localized in uncovered parts of the body.

In addition to such views as those expressed by Hodson, that pellagra is not a definite disease, there exist five distinct theories—namely, the intoxication, auto-intoxication, infection, photodynamic and deficiency theories.

According to the first, held by the Italian authors (Ceni, Otto,

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(1) The work of Prof. Guido Tizzoni, entitled *Sulla possibilità di trasmettere la pellagra alla Scimia*, is announced in *Rendiconto delle Sessioni della R. Accademia delle Scienze dell'Istituto di Bologna. Classe di Scienze fisiche.* Nuova Serie : Vol. XV. (1910-1911). Bologna, 1911. (*Ed.*).

(2) See *B.* April 1912, No. 605. (*Ed.*).

Lombroso, Gosio, Gavina, Bertarelli, Antonini, Camuzzi), the disease is caused by toxic substances produced in maize by the action of micro-organisms, especially fungi (*Aspergillus*, *Penicillium*, etc.). The ferments capable of producing the toxic substances remain active even after cooking.

According to the auto-intoxication theory (v. Neusser, De Giaxa) pellagra is due to toxic products formed in the intestine under the influence of certain bacteria, especially of *B. coli.*

As regards the infection theory, an enormous amount of different organisms have been credited with the power of causing pellagra : a particular strain of *Penicillium glaucum*, *Aspergillus fluorescens* and *A. fumigatus*; *Streptobacillus pellagrae*, a protozoon transmitted by a biting fly of the genus *Simulium.*

But post mortem bacteriological investigations (Raubitschek) revealed nothing in favour of the infection theory of the etiology of pellagra and the sero-diagnostic examination of the blood did not show the presence of antibodies against maize proteins or germs contained in maize.

According to Raubitscheck's photodynamic theory, spoiled maize produces a toxic substance, which is able to sensitize the skin for sun rays.

The deficiency theory is the one brought forward by the writer. He draws attention to the fact that the diet in pellagra districts is very one-sided and consists chiefly of starch, which is known to produce beri-beri. Maize prevents beri-beri and scurvy, as do beans, vegetables, milk and potatoes ; these appear, though in very small quantities, in the diet described by Lombroso and Camurri. Thus Dr. Funk concludes that pellagra is due, probably, to the deficiency of a vitamine different from those of beri-beri and scurvy.

Food has, up till now, been valued only by its content in proteins, fats and carbohydrates and calories value ; but the nutritive value of the proteins depends on their amino-acid content. An animal fed on proteins which differ in the quantity of amino-acids from the proteins of its own body, is forced to use much more proteins and is unable to use these amido-acids, which are in larger proportion in the food than in its own body. In future, the amino-acid and vitamine content will have to be considered.

It is to deficiency in vitamine that the fact must be attributed, that proteins which contain sufficient amino-acids to maintain adult animals in nitrogenous equilibrium, prevent normal growth in young animals. A deficiency in vitamines produces also a predisposition to many other diseases, among which rickets may be mentioned.

O'CONNELL, MATHEW D. **The Relation between Climate and Malaria.** **1181**

1* The Scientific Investigation of Malaria.

2* The Meteorology of Malaria. — *The Journal of Tropical Medicine and Hygiene*, Vol. XV, No. 4, pp. 57-60; No. 12, pp. 177-178. London, February 15 and June 15, 1912.

British India

1.* According to the writer, the scientific study of malaria should be accompanied by meteorological observations for the purpose of ascertaining the conditions under which the disease attains its maximum of prevalence in any locality, and for comparison, similar observations should be made in the same locality when the disease is at its minimum or altogether absent. By detailed observations, Dr. O'Connell means hourly observations of the dry and wet bulb thermometer and of the rate of motion of the atmosphere for a period of twenty-four hours.

Some examples will illustrate the importance of this suggestion. At Lahore, Punjab, malaria is at its minimum in April, begins to increase in August, and reaches its maximum in September. From the meteorological conditions of three nights (since the anophelines are most aggressive at night) during each of the above months, a table is constructed, with the aid of Glaisher's tables, giving the hourly temperatures from 4 p.m. on one day to 6 a.m. on the following day, and showing the relative percentage of the humidity of the atmosphere and the direction and force of the wind.

From this table it is seen that at the time of the most severe outbreaks of malarial fever, the atmospheric temperature during the *whole* night was such as, of itself, to raise the temperature of the human body. That exposure for many successive hours to a hot damp atmosphere raises the body temperature was proved without doubt by the enquiry of the Departmental Committee appointed in Great Britain to investigate the hygienic conditions of the cotton weavers, which were proved to be better than those prevailing in Lahore during August and September (see the final *Report of the Departmental Committee on Humidity and Ventilation in the Humid Cotton-Weaving Sheds of Lancashire:* Wyman and Sons, Fetter Lane, London, E. C.).

Straits Settlements

2.* The witer undertook to determine whether, outside India, the temperature and humidity of the atmosphere, at the time when malaria was prevalent, were such as, of themselves, to raise the temperature of the human body. He showed that this was so in the case of the high mortality registered in May 1912 at Singapore.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

1182 HENNET, LEOPOLD von. **Winter Agricultural Schools in Switzerland and in Austria.** (Die landwirtschaftlichen Winterschulen in der Schweiz und in Oesterreich). — *Mitteilungen der Fachberichterstatter des K. K. Ackerbau-Ministeriums und Spezialberichte auf dem Gebiete des internationalen Holzhandels,* Nr. 11, pp. 85-89. Wien.

The winter agricultural schools are devoted to the children of farmers who during the rest of the year are occupied in field work. In Switzerland youths who have gone through the elementary courses are admitted; the courses extend over two consecutive winters. In Switzerland small holdings predominate; of the 252 496 farms existing in that country only 2 664 exceed 173 acres (and of these upwards of 1200 belong to cantons, public administrations and corporations). The education of the children of farmers and of small land-owners is thus specially important. It is well organized and continually progressing.

Switzerland

Higher agricultural education is given in the agricultural section of the Zurich Polytechnic, while dairying, wine-making, fruit-growing and market gardening are taught in numerous special schools, among which deserve to be mentioned the intercantonal dairy school of Rütti, and the fruit and vine-growing school of Wädenswil. In most of such schools special courses of various duration are held. Both cantons and numerous Societies provide travelling lecturers. Of late years the Federal Government has granted the cantons about £ 1 600 towards the cost of travelling lectureships, for cheesemaking, for the inspection of stables and of mountain pastures etc.

Hitherto instruction in domestic economy was organised better in the towns than in the country; but schools for women in which the theory and practice of agriculture are taught have also been founded, such as the school at Niederleng (Aargau) devoted especially to domestic economy and horticulture for the daughters of farmers; the agricultural girls' schools in connexion with the winter schools, of the cantons of Lucerne, St. Gallen, and Geneva. In the canton Berne — eminently agricultural — a law has recently been approved, by referendum, on the reorganisation of agricultural education, in which the spread of instruction in domestic economy in the country is provided for.

The type of the middle agricultural school is represented by the agricultural schools in which the theory and practice of agriculture are taught. There are four of them: at Strickhof near Zürich, (founded in 1853); at Rütti near Berne (1860); at Cernier near Neuchâtel (1885) and at Ecône in the Valais. The following data refer to the above schools:

	Staff 1910-1911			Farm,	Number of pupils		Cost of tuition
	Teachers	Assistants	Employés	acres	1904-05	1910-11	£
Strickhof . .	3	7	3	96	40	64	1 107
Rütti	3	7	4	217	61	69	1 182
Cernier. . . .	1	10	2	232	32	33	1 335
Ecône	2	9	2	25	24	21	672

Canton Ticino does not possess any agricultural schools, but only travelling professorships.

It seems that intensity of education and co-operation proceed hand in hand: German Switzerland holds the first place in both. It has also been noticed that where agriculture is most remunerative the number of pupils in the agricultural schools is highest.

About thirty years ago the first winter schools were founded in Switzerland (Lucerne, Lausanne) some of which are independent, most of them however are attached to an agricultural school. Thus the Rütti school has two branch schools (211 pupils) and the Strickhof school has one branch (63 pupils). In 1897 there were 7 winter schools with about 300 pupils; in 1904-1905 the schools were 12 with 636 pupils; in 1910-1911 16 schools (branches included) with 954 pupils. In these figures the pupils that attend only some of the courses are not included. During the last 6 years the attendance at the winter schools was 50 % of the entries, while in the agricultural schools it was only 20 %.

Austria

The status of agricultural education in Austria is shown by the following table:

	Number of farms with a cultivated area above		Number of winter schools	Number of pupils of the winter schools	Number of pupils of winter schools per 1000 farms above	
	4.94 acres	12.35 acres			4.94 acres	12.35 acres
Lower Austria . .	92 306	63 934	5	190	2.05	2.96
Upper Austria : .	53 504	38 251	—	—	—	—
Salzburg	11 762	9 192	1	27	2.29	2.93
Styria	90 619	50 949	2	51	0.56	1.00
Carniola	23 151	16 604	5	118	5.09	7.10
Tyrol and Vorarlberg	61 446	29 190	3	79	1.28	2.70
Bohemia	303 589	159 508	29	1 200	3.95	7.52
Moravia	140 276	73 791	33	1 011	7.20	13.7
Silesia	29 188	14 866	5	63	2.15	4.37
Galicia	558 094	189 034	2	34	0.06	0.17

1188 **A Practical Course of Wine Analysis by the Electrical Conductivity Method, to be held at Lausanne, Switzerland.** (Cours pratique d'analyse des Vins par Volumétrie physico-chimique — Méthode des conductibilités électriques — par MM. les prof. P. Dutoit et M. Duboux à l'Université de Lausanne, Suisse, du 26 Août au 3 Septembre 1912). — Official communication.

Switzerland

A practical course on the volumetric physico-chemical analysis of wine by the electrical conductivity method will be held by Prof. P. Dutoit and Prof. M. Duboux at the University of Lausanne from August 26th to September 3rd 1912. Its object is to acquaint analytic chemists, without loss of time, with the new methods of analysis described in the treatise on the physico-chemical volumetric analysis of wines. (1)

It includes: 1) Some theoretical lessons on the general principles of the method and their applications. 2) Many practical exercises consisting in analyses made by the students themselves. (Each person will be provided with the necessary experimental material and apparatus for the determining of electrical conductivity).

The exercises are so chosen, that the determinations which have always to be made (ash, sulphates, chlorides, tartaric acid and the amount of acidity) are carried out first. The other compounds in the wine (phosphates, lime, malic acid, succinic acid, etc.), with which the chemist troubles himself little from lack of rapid and accurate methods of estimation, are then dealt with.

In addition, some exercises on the determination of the total alkalinity and of slight acidity (tannin substances) will show chemists that the conductivity method permits of the estimation of important compounds, which have hitherto escaped detection by means of ordinary analysis.

Those who prefer to confine themselves to the ordinary analysis could replace the latter experiments by analysis of water or of metallic solutions carried out in the same way, since even in this case physico-chemical volumetric analysis is quicker and more accurate.

The entrance fee of 50 fr. (£2) includes the right of attending the course and taking part in the practical work, as well as the use of the apparatus and materials necessary for the analyses.

Entries are accepted up to August 10th and names should be sent to Prof. Dutoit (Ecotaux, Canton de Vaud, Suisse).

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(1) P. Dutoit and M. Duboux: *L'analyse des vins par Volumétrie physico-chimique.* In-12 of 190 pages. Lausanne: Rouge.

AGRICULTURAL INSTITUTIONS.

1184 **The British East Africa Fibre Association.** — *The Agricultural Journal of British East Africa*, Vol. IV, Part II, pp. 103-105. Nairobi, 1912.

British East Africa

On 13th December 1911 an Association called "The British East Africa Fibre Association" was formed in London (Salisbury House, London Wall, E. C.), with the following objects:

1. To study all matters relating to fibre production, etc. etc.

2. To disseminate amongst the subscribers the latest literature referring to fibre in various parts of the world.

3. To report upon prices realised, and give reasons (if any) why best prices were not obtained.

4. To study carefully and advise upon the best methods of standardisation and grading.

5. To take up matters which might, with advantage in the interests of the industry, be discussed at the Colonial Office.

6. To negotiate with the Railway in British East Africa and the Shipping Companies, as to reduction of freights.

7. To study and advise as to the best types of machinery to be used.

8. To obtain quotations, and if desired to execute orders, for machinery, baling-material, etc., upon the very best terms, for the members of the Association.

AGRICULTURAL SHOWS AND CONGRESSES.

1185 **The Exhibition of Packing-Materials Organized by the Paris-Orleans Railway Company in 1912.** (Exposition de materiel d'emballage organisée par la Compagnie de chemins de fer Paris-Orléans en 1912). — *La Revue Générale du Froid*, 4ᵉ Année, Tome IV, No. 5 (No. 36), pp. 304-305. Paris, mai 1912.

France

On the occasion of the Central Agricultural Competitions which will be held in 1912 at Bourges, Libourne, Limoges and Poitiers, the Paris-Orleans Railway Company will organize:

1) A general exhibition of packing-materials, in which they invite the collaboration of manufacturers desirous of making known their methods of transporting poultry, meat, fruit, vegetables, butter and eggs.

2) A competition, with the object of discovering the best way of packing family provisions. The cases must be secure, con-

venient, of a low price within the reach of all, and must be able to be turned out in such quantities that they can be generally used.

1816 **The Second National French Cold Storage Congress at Toulouse.** (Le IIe Congrès National Français du Froid à Toulouse).

France

The programme of the Second National Cold-Storage Congress, which will be held at Toulouse on the 23rd, 24th and 25th of September next, has just been published. This Congress, organized by the French Cold-Storage Association, under the patronage of the Ministries of Agriculture, War, the Colonies, the Interior, Commerce, Industry and Public Works, aims at making known the results hitherto obtained in France and her Colonies by cold-storage methods, and especially to show that national interests require that France should, without loss of time, make use of this system, both in agricultural and military matters.

The Congress will be followed by two excursions undertaken for the purpose of giving the members the opportunity of studying the application of cold storage to wine-making in the South, and to the Roquefort cheese industry. One of these excursions will conclude with a visit to the Cold-Storage Exhibition at Bourges organized by the *Automobile Club du Centre.*

For all information regarding the Congress, application should be made to the "Secrétariat de l'Association Française du Froid," 9 Avenue Carnot, Paris, or to the headquarters of the "Comité Toulousain du Congrès du Froid" at the Mairie, Toulouse.

1817 **Seventh International Agricultural, Horticultural, and Poultry Show at Varese, Province of Como, from August 25 to September 20 1912.** — Communicated by the Società Orticola Varesina.

Italy

Under the auspices of the Società orticola Varesina the seventh international show of agriculture and horticulture and of samples of food-stuffs, of packing, and of implements used in horticulture and poultry-raising will be held at Varese in the province of Como between August 25 and September 20, 1912.

The Italian State Railways have granted the customary reductions for the carriage of goods and in the passenger fares for exhibitors and members of the juries.

The poultry and rabbit show includes both fancy and utility breeds; rabbits, guinea pigs; implements, publications etc.

An exhibition of curiosities, monstrosities, and anomalies of vegetation in general and of unknown, forgotten, rare or new plants etc., will be held between August 25 and September 1. Cut flowers will be exhibited on September 1 and 15, and objects made with flowers on September 8 and 20.

Applications for entries are to be addressed to the offices of the Società orticola Varesina, 3 Via Indipendenza, Varese.

Motor Exhibition at Melbourne, Victoria, Australia. — *The Board of Trade Journal*, Vol. LXXVII, No. 812, p. 623. London, June 20, 1912. **1188**

The Automobile Club of Victoria Ltd. has decided to hold an Exhibition of motor cars and accessories at Melbourne from 31st August to 7th September next, during the Agricultural Show week. Firms wishing to secure space may be able to do so if they cable to " Autoexhib, " Melbourne. **Australia Victoria**

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

BROUNOFF, P. **Some Considerations on the Organisation of the Agricultural Meteorological Service.** (Quelques considérations sur l'Organisation du Service météorologique dans les buts de l'Agriculture), pp. 1-12. S. Petersburg, 1912. **1189**

The organisation of the meteorological service in most civilized countries allows the solution of two practical problems: *a*) the study of the climatology of any given region, *b*) weather forecasting for the next 24 hours. **Russia**

The solution of these problems, however, is not sufficient for the needs of agriculture. It is indispensable to know how, and according to what law, this or that meteorological factor acts on the plants and on the soil under natural conditions, otherwise no advantage could be drawn from a knowledge of the climate of a given region by selecting the systems of cultivation and the varieties of plants best adapted to it. For the solving of this problem the organisation of a special service of agricultural meteorology is necessary in order to study the influence of meteorological factors directly on plants or indirectly on them through the soil.

A service of this kind has already been organised in Russia for the last 15 years. It deals with:

A) The connection between meteorological changes on the one hand and the modality of the growth of plants and the importance of the crops on the other.

B) The influenee of the weather on the production of milk, on bee-keeping, on fish-breeding, etc.

D) The injury to agriculture caused by meteorological factors.

D) The influence of climatic conditions on the appearance and development of plant diseases.

The first of these questions is the one best studied; the material already collected is considerable. The work is carried out under the general direction of the Meteorological Office of the Ministry of Agriculture, which has organised in Russia a close network of agricultural meteorological stations according to the programme drawn up by this Office. " There is a considerable number of studies on the influence of meteorological conditions on plants, but generally the weather is only compared with the quantitative results of the yield. There are also data on the effect produced on the latter by the totality of the meteorological factors or by their averages for the whole period of vegetation of the given plant. These works have the typical character of statistical studies and can give no assistance in establishing the correlations between meteorological and agricultural elements. " This is due to the fact that the distribution of rain or of heat has evidently more influence on crops than the total quantity of the rain or of the heat. There are periods in the lives of plants in which they have a more absolute want of a certain quantity of moisture or in which they suffer more from great falls in temperature, than at any other time. And it is only an accurate knowledge of these periods and of the succession of meteorological factors within the limits of these periods which will enable farmers to adapt their crops to the climatic conditions of a given region.

The works mentioned above have also the defect of often comparing the yield of one locality with the climate of another locality situated at a distance of several miles, which is highly irrational, as the distribution of meteorological elements in the atmosphere and in the soil varies considerably from one locality to another. It is therefore indispensable that the meteorological station be near the experiment field connected with it, not only in mountainous regions, but also in the hills where meteorological conditions vary often within short distances. Thus the connection between frost and the differences of level, between the amount of sunlight and the inclination of slopes, is generally well known.

These considerations lead to the following conclusions:

1. Observations of meteorological elements and of the growth of plants must be made contemporaneously and in the same locality.

2. The period of vegetation of plants must be divided into various stages, in each of which the relation with meteorological factors varies.

3. The name Agricultural Meteorological Station should designate a station in which, on special plots, parallel researches are carried out on the meteorological factors and on the growth of plants. According to the kind of crop examined, these stations are distinguished as field, garden, forest stations, etc.

4. The determination of the connection between the growth and the yield of the plants grown, on the one hand, and the meteorological conditions on the other, may lead to important practical results. Thus for instance when it is known at what period of vegetation a certain plant requires a given quantity of moisture or is most sensitive to frost, to heavy rains, etc.; when the duration of the different periods of vegetation are known, from the time of sowing to that of sprouting, from this to tillering, and so forth, it will always be possible either by the selection of certain types or by hastening or retarding sowing, to cause the " critical period " of the plant in regard to a certain factor, to coincide with the moment in which this factor gives, on average, its optimum value. Though based on average weather (because it is not possible at present to know beforehand the real weather) this adaptation has nevertheless already given excellent results in European Russia.

Another advantage deriving from a knowledge of the critical periods of plants is the possibility of fixing the period of irrigations, which is of the greatest importance in the semi-arid regions of Turkestan.

5. In the experiment fields the local type of rotation should be adopted. If it sometimes tends to complicate the work of the observer, on the other hand it renders the results of the observations more practical and easier to apply. The area of the plots should never exceed half a hectare (1 ¼ acres) nor be less than $1/40$ of a hectare ($1/16$ of an acre).

6. The whole field and the plots should be under the same topographical and soil conditions.

7. In the experiment fields the following instruments should be set up: dry and wet bulb thermometers; maximum and minimum thermometers in screens; rain-gauge; anemometer; minimum thermometer on the surface of the fallow soil; minimum thermometer among the plants at a level with their tops (in order to observe the effects of frost): this thermometer should be so arranged as to slide along a rod fixed vertically in the ground; thermometers for observing the temperature at different depths in the soil; and a heliograph

for registering the duration of sunlight. There are no instruments for measuring evaporation from an agricultural point of view, and it would always be impossible to determine the quantity of moisture on the surface of the soil, the quantity which descends by percolation, the quantity which ascends from the lower layers, etc. It is therefore customary to attribute much importance to the determination of the moisture of the soil, which gives an exact idea of the amount of water available for plants at the moment the observation is made.

8. If all conditions are uniform, excepting meteorological conditions, only these will have to be determined: heat, moisture and light. Then in order to estimate their influence on the vegetation and yield of a plant the graphical method should be adopted, as it allows of the " critical period " being determined with sufficient accuracy; this is all the easier when one of the three factors never exceeds by much its minimum value, because in this case the success or failure of the crops depends upon its oscillations, however small they be. It is so with moisture in the southern half of Russia-in-Europe.

9. In the agricultural meteorological stations, account is also kept of the injurious meteorological factors which are registered. In some stations of southern Russia experiments have been made on the best means of control, such as sumdging against sudden falls of temperature.

10. Horticultural stations should be organized on the model of the agricultural stations. Several of them already exist in Russia: they study the influence of the weather on the growth and yield of fruit trees and shrubs. Since last year some special stations for forage plants have been founded. There are also other stations that carry out parallel observations on the life of bees, on the honey-bearing plants and on the weather. Among other things readings are taken of the inside temperatures of hives.

11. The general direction of agricultural meteorological stations should be entrusted to a central agricultural meteorological organisation, formed of meteorologists, agriculturists and botanists.

12. A staff: 1) of specialists in agricultural meteorology; 2) of observers for the agricultural meteorological stations, should be prepared and trained by means of special courses in the schools of agriculture.

13. The systems and means of observation should be improved; for instance by the construction of sufficiently exact evaporimeters and actinometers for the use of the stations; by devising the

means of properly arranging thermometers for the study of frosts; by improving the instruments for measuring dew, etc.

14. The signs of changes in the weather (phenomena of optic refraction in the atmosphere) in various localities should be studied. These signs allow of weather forecasts being made without the use of special instruments.

1140

FLAMMARION, C. **Late Summers and Warm Autumns in France.** (Rapport sur les Travaux de la Station de Climatologie agricole de Juvisy pendant l'année 1910). — *Ministère de l'Agriculture. Direction de l'Agriculture. Bulletin mensuel de l'Office des Renseignements Agricoles.* Onzième Année, No. 4, pp. 460-477. Paris, 1912.

France

During the year 1910 the meteorological conditions were anything but favourable to agriculture. After the disastrous floods of January the soil was completely saturated with water and; as if this was not enough, it continued to rain, thus rendering the soil cold and sterile for all cultivated plants from the vine to the potato. At the same time in the United States excessive heat prevailed and the westerly winds arriving laden with vapours in the cold regions of France caused abundant precipitation which extended to Belgium, Germany and Austria. It may be said that the warm weather did not begin till September, when it increased and kept above the average during the whole month of October. Abnormally cold summers followed by warm autumns were observed also during the years 1905, 1906, 1907 and 1909. For 1910 the following data are given:

Month	Average temperature in the 24 h. in C°	Normal temperature in C°	Maximum temperature in C°	Date	Rain in mm.	Normal rain in mm.
January. .	3.8	2.3	12.8	15	74	40
February .	5.2	3.6	15.4	22	67	31
March . . .	6.4	5.9	17.9	9	20	41
April. . . .	8.8	9.9	20.5	19	46	42
May. . . .	12.6	13.0	25.2	16	82	53
June. . . .	16.5	16.5	27.4	21	96	59
July. . . .	16.3	18.3	27.6	15	70	56
August . .	17.2	17.7	26.7	14	36	55
September	14.2	14.7	25.7	29	19	50
October. .	11.8	10.1	23.7	1	81	59
November	5.1	5.8	13.8	1	114	46
December	6.3	2.7	14.8	16	46	45

July, as is seen from the above table, was colder than June and two degrees below the normal; August and September were also below the average, while October was almost two degrees above normal and December 3.6°.

As in the four preceding years it is only after the middle of September that the action of the sun appears intense and continuous, too late however for all cultivated plants. Late summers and warm autumns are at present characteristic of the climate of certain parts of France.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOYG.

1141 HALL, A. D. and RUSSELL, E J. **On the Causes of the High Nutritive Value and Fertility of the Fatting Pastures of Romney Marsh and other Marshes in the S. E. of England.** — *The Journal of Agricultural Science*, Vol. IV, Part 4, pp. 339-370. Cambridge, June 1912.

England

The coast of Kent and Sussex is to a great extent bordered by flat areas of alluvial land, elevated but little above high water mark, known as the Marshes. Though certain portions are under the plough, this land as a rule lies in permanent grass and affords some of the best grazing known in the south of England.

In a vertical section of these marshes four layers of material are recognisable: at the surface a loam or clay which forms soil and subsoil proper, below which comes a layer of peat often containing tree stumps and resting on blue clay, and below that again sand.

Throughout the greater part of the Marsh the clay from which the soil arises is of a rather heavy type. It contains about 45 per cent of fine sand and silt, from 15 to 25 per cent of fine silt, and 25 per cent of clay particles. It contains also from 4 to 15 per cent. of carbonate of lime.

Though the grassland of all the marshes is generally rich, it is by no means equally fertile everywhere. In most places there are pastures possessing great local reputation and capable of fattening through the summer months from 6 to 8 or more sheep to the acre. Adjoining these fatting fields there generally exist other fields apparently of the same character but which will do no more than keep sheep in a growing condition.

The feeding value of pasture grass is determined not only by the floral type (*i. e.* the botanical composition of the herbage) but also by the habit of growth (leafiness or stemminess). The floral type is determined by climatic factors — temperature and the supply of air and water to the roots — the reaction of the soil and the treatment of the grass, but is not necessarily affected by variations in the amount of nitrogenous plant food present. The habit of growth is governed by a different set of factors more difficult to ascertain, among which the most important appear to be the supply of nitrogen and of phosphate in the soil. Thus floral type and habit of growth are independent. Cases occur in which the general soil conditions and floral type persist over two adjoining fields, but the habit of growth and the feeding value of the grass are very different.

In attempting to ameliorate a pasture it is necessary to ascertain whether its poverty is due to bad floral type or to habit of growth. Mere casual inspection is insufficient, because a tendency to flower may make one species appear much more prominent than it really is. The value of the pasture is not determined by the floral type of the herbage, but by the habit of growth. On the good land the grasses are essentially leafy with broad blades and much less tendency to run up to flowering heads. On the non-fatting fields the herbage is markedly stemmy, the leaves are fewer and narrower and the flower heads come early and abundantly.

The soils of the fatting fields possessed no constant properties revealed by the ordinary chemical or mechanical analyses. Their striking characteristic was the high rate at which nitrates were produced; they also contained a relatively large amount of total phosphoric acid. They had also a somewhat better texture than the soils of the non-fatting fields, allowing excess of water more readily to drain away and retaining moisture better during dry weather, but this property could not be correlated with the mechanical composition of the soil.

ODÉN S. **The Acid Properties of Humus.** (Kolloidchemische Untersuchungen über Humussubstanzen. I. Untersuchung des Sphagnumtorfs). — *Arkiv f. Kemi* etc. *utg. af K. Svenska Vet. Acad. i Stockholm* 4, No. 24, 1912. — *Zeitschrift für Chemie und Industrie der Kolloide,* Band X, Heft 6, pp. 320-321. Dresden, Juni 1912. **1142**

One of the most important soil problems is that of the chemico-physical nature of humus. The writer has just begun a series of researches with the object of separating and determining the colloidal and non colloidal substances in humus. J. M. van Bemmelen (*Die Absorption,* pp. 117 et seq.) has already recognized the presence of colloids in humus. Recently, A. Baumann and E. Gully (*Mitt. der K. Bayr. Moorkulturanstalt,* 3, pp. 31, 52), taking this fact as a basis, have stated that the acid property of humus is due to colloidal substances, to which they attributed an absorbent action **Sweden** towards basic substances, and so denied the existence of humic acids properly so-called.

The writer has, for the present, limited his experiments to sphagnum peat. He effected the separation of the humic constituents by means of successive treatments with water, dilute ammonia, alcohol, coagulation with common salt, centrifugation, and filtration with a Chamberland filter, and succeeded in discovering three typical substances (*e*, *f*, *g*), besides some other non-colloidal organic compounds.

The important fact, however, is that by subjecting the peat to hydrolysis with an alkali, part of the substance *g* was peptonized. The reaction consisted, however, essentially in the formation of an alkaline non-colloidal compound from the so-called humic acid. This does not confirm the opinion of Baumann and Gully, who saw in the reaction only a peptonization carried out by the alkali.

In conclusion, the assertions of Baumann and Gully, which exclude the direct chemical action of the alkali on the so-called humic acids are not entirely corroborated by colloidal chemistry (1).

1148 FLETCHER, C. C. and BRYAN, H. **Modification of the Method of Mechanical Soil Analysis.** — *U. S. Department of Agriculture, Bureau of Soils, Bull.* No. 84, pp. 16 + pl. I-VII. Washington, 1912.

United States

This is a modification of the method of mechanical analysis of the soil, as carried out in the Bureau of Soils of the U. S. Department of Agriculture. The method and its modification are based upon the following limits of mechanical grades:

	mm.
Fine gravel	2-1
Coarse sand.	1-0.5
Medium sand	0.5-0.25
Fine sand, ...	0.25-0.1
Very fine sand . . .	0.1-0.05
Silt.	0.05-0.005
Clay	0.005-0.0009

At the present time the collection of soil samples in the Bureau numbers over 20 000, the majority of which have been subjected to mechanical analysis. Nearly 2 000 are being added annually. In order to perform the work quickly and accurately some modifications have been devised. The new modified method may be summed up as follows:

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(1) Recently, also, Tacke, Suchting, Arnd and Dirks of the Bremen Moorculture Experiment Station have not confirmed experimentally the data of Baumann and Gully. (*Landw. Jahrbücher*, XII. Band, Heft 5., pp. 717-754, 1911).

The samples collected in the field are reduced to 8 smaller samples by quartering as usual, and passed through a 2 mm. sieve. The fine earth is dried in aluminium dishes for two hours in the electric oven. It is then cooled in a desiccator, 5-gr. samples weighed out, and put in 8-ounce steriliser bottles with 2 oz. of water and a few cc. of ammonia, and shaken by the mechanical shaking machine at least seven hours. Each of the samples is in turn brought into suspension by the use of a compressed water jet, and sufficient time is allowed for all the sands to settle, the process being controlled by microscopic examination. The liquid is then decanted into the centrifuge tube, and centrifuged until there are no silt particles left in suspension. The clay suspension is poured into a porcelain pitcher and the treatment repeated. When the separation is complete, the sands are in the steriliser bottles, the silt in the centrifuge, and the clay in the porcelain pitchers.

The sands are transferred from the bottles to small platinum dishes, dried and cooled. The total weight is determined, after which the separation is made with a set of sieves. Separation is usually effected by three minutes' shaking. Each of the sands in the sieves and bottom is weighed; the total weight should come within 10 mgr. of the initial weight. The silts are transferred from the tubes to platinum dishes, dried, cooled, and weighed similarly to the sands. The clay-water is evaporated in enameled-ware cups having a capacity of 300 cc., the clay being weighed in them without transfer to platinum dishes. The clay may also be determined by difference, which is stated to give results accurate within 1 per cent.

A detailed description, with drawings of the shaking machine, the sieves, the mechanical sieve shaker, and the centrifuge are given at the end of the Bulletin.

BEAM, W. (abstract by RAMANN, E.). **The Mechanical Analysis of Arid Soils.** — *The Cairo Scientific Journal*, V, pp. 107-119. (Abstract in *Internationale Mitteilungen für Bodenkunde*, B. II, H. 1, pp. 130-131. Berlin, 1912). **1144**

Anglo-Egyptian Sudan

The writer, chemist to the Welcome Laboratories for Tropical Studies at Khartum, shows how the soils of tropical and arid regions differ from those of other districts in their calcium carbonate content and especially in the amount of calcium sulphate in the subsoil, and in the low humus content, which in semi-arid zones scarcely reaches ½ %. Hence the necessity for a single method of analysis, capable of general application, for the purpose of establishing data for comparison. The writer deals only with mechanical analysis.

Clay soils, *i.e.* those containing about 54 % of clay, are difficult to deal with. By taking 5 gr. of the soil and 75 cc. of water and using either a rotating machine, or an American agitator (of 100 motions per minute), only about half of the clay can be brought into suspension. But the difficulty can be overcome by the addition of sodium carbonate, a 2 % solution being the best for the purpose. For the separation of the different soil particles a camelshair brush of ½ in. diameter (preferably with the hair cut) is recommended. The soil is made into a thick paste with a few drops of water, and then water is added drop by drop, and after working it for from 5 to 10 minutes the separation is complete. Then it is decanted five times; after the third time the residuum is mixed up again with the brush.

In the classification of the size of the different soil particles, the writer takes as a basis, the limit of 0.002 mm. for clay. Thus we have the following classes :

a) particles of more than 2 mm. ;

b) particles of less than 2 mm., the fine soil, to be separated into particles of 0.2-2 mm., 0.02-0.2 mm. and 0.002-0.02 mm.;

c) particles of less than 0.002 mm., the clay.

The following is the manner of proceeding : 100 gr. of air-dried soil are passed through a sieve with 2 mm. round holes. The fine soil is afterwards separated by a 1 mm. sieve, and the sandy residuum then washed. The fine portion is then dried at 110° C, 5 gr. or somewhat less are taken, treated with a 2 % solution of sodium carbonate, mixed by means of the brush and placed in a cylindrical vessel, the solution being added up to a height of 10 cm. In the case of a large amount of clay, it is necessary to allow the vessel to stand for one night; not less than eight hours are always necessary. The decanting must be carried out at intervals of eight hours, and each time ½ gr. of sodium carbonate is added to the water used. If the mixture becomes flocculent, less is used in the two first decantings, about 0.2 gr. per litre. As has been said, after decanting three times, the residuum must be mixed up again by means of the brush.

After the removal of the clay, the residuum is washed with distilled water in a 200 cc. vessel and again left eight hours to settle. When the water becomes clear, the residuum is dried and weighed and the amount of clay determined from the difference in weight. When it is necessary, however, the soluble salts and the humus are deducted. The residuum is finally treated in the usual manner.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

BENINI, F. **The Reclaiming of " Burr " Land in Lower-Egypt.** (La riduzione a coltura del terreno " Burr " nel Basso Egitto). — *L'Agricoltura coloniale*, Anno VI, No. 5, pp. 181-190. Firenze, maggio 1912. **1145**

Lower Egypt

" Burr " land is the name applied in Egypt to land which has been abandoned by cultivators on account of its being impregnated with salt. The common " burr " is clayey and rich in organic-mineral substances, brown, soft, easily worked from its friability, which is due to the presence of salt, and covered with a salt-containing stratum of fine dust (12 % of salt) which the wind piles up in mounds. Banks of sand, hillocks of " kefri " (ground covered with the ruins of ancient buildings), and erosions due to rain, break the uniformity of the " burr " plain.

This soil, besides being of the most frequent occurrence, is when freed from salt especially adapted to growing cotton (1).

In order to render it once more fertile, it is necessary to employ such a rotation of crops as will not only prevent the efflorescence of the salt, but also keep it further from the surface, thus increasing the depth of the non-saline stratum.

The following three-year rotation is considered useful.

I. Rice	from Jan. to Oct. of first year.
II. Berseem	from Oct. of first. year to June of second year.
III. Warping	from June to December of second year.
IV. Cotton	during the third year.

This rotation is carried on for many years, so long as the excess of salt threatens to become too much for the arable land.

Five years of preparation are necessary before the soil is ready for the three-year rotation, and these five years are occupied as follows:

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(1) See *B.* March 1912, No. 488; April 1912, No. 657. (*Ed.*).

tioned above without the application of water. The *basin* system of cultivation is still largely practised in Upper Egypt, but cotton is not grown as a *basin* crop. The system is doubtless of the greatest antiquity and has only been improved recently by the adjustment of the water supply by the Irrigation Department to ensure that as little as possible of the basin land should be left unwatered.

The " red water " of the Nile is run into the basins, which vary in size, and the silt is permitted to be deposited upon the land while the water itself drains away. In short flood years, the water which has drained through one basin is now permitted to reach the Nile before being used to flood another ; and it is better to give water without silt to these lands then to give no water at all. By the recently adopted methods the basins are filled as early as possible and are permitted to drain away in from 30 to 40 days so that the cultivator may have plenty of time to plant his winter crops. As the water recedes the seed is usually broadcasted on the wet soil ; if sown later upon a drier surface, the plough or the hoe is used to cover the seed. No further attention is given to the crops until the harvesting season, and the land dries up to a considerable extent, often cracking to a depth of two metres. The effect upon the crop is frequently shown by the shrivelled state of the grain in the case of wheat and barley, although on account of the richness of the silt deposited upon the land the yield is generally fair. The modern basin cultivation in Egypt is in opposition to the principles recommended for land in similar conditions.

Without previous deep cultivation or subsequent pulverization of the soil fair crops are obtained, but by an improvement of the methods much better crops could be assured and it is even possible that sufficient water might be retained in the soil to allow another crop of a different variety being grown during the summer. Wheat sown in drills on deep ploughed soils with subsequent light cultivation should be much superior to that which is frequently watered, as the latter operation often only increases the length of the straw at the expense of the grain.

By the dry farming method the assimilation of plant food is a slower process for the plant than where copious water is applied, but in the latter case the useful constituents are frequently washed away before they can be utilized. To a great extent the employment of original deep ploughing followed by frequent light cultivations, could with advantage be adopted in perennially irrigated lands; these lands could be watered less copiously and less often and the injury to crops by water-logging need then never occur.

MANURES AND MANURING.

Potash from Seaweed.

AGRICULTURAL SITUATION.

1147

United States

There is yet arable land to be occupied in the United States, but the time for pioneer invasion of virgin territory is past. In a broad sense the United States are now settled. Already the readjustment of population, the necessary consequence of this settlement, is going on, and the return tide of immigration from the West to the East is beginning to attract public attention. With the readjustment of the population there must inevitably come a readjustment of land values; which represents a great national problem and is dependent upon a better use of the land, involving the general introduction of intensive methods of agriculture, including a rational management of the soil through tillage, crop rotations and fertilisers. Tillage and crop rotations are mainly problems within the control and dependent only upon the judgment of the farmer himself. Fertilisers, however, involve problems of quite different character. bringing the farmer into contact with those of manufacture, distribution, sources of supply, etc., which is stated to call for governmental assistance.

FERTILISERS SITUATION.

At present about $120 000 000 annually is spent in the United States for commercial fertilisers. More than 80 per cent is spent in the South Atlantic States and about 3 per cent. west of the Mississippi River. The use of fertilisers in Texas, Mississippi, and the citrus fruit regions of California has been increasing rapidly in the last few years. With the development of the use of fertilisers in the older regions and its extension into the agricultural sections of the West, a vast industry must come into existence in the next few years, of fundamental importance to the agricultural interests.

Public attention has therefore been drawn to the possible resources of fertilizer materials of the United States, and at the first regular session of the 62nd Congress authority was given to the Bureau of Soils and the Geological Survey to explore and investigate for sources of fertiliser materials.

POTASH SITUATION.

The controversy, now settled, between the German « Kalisyndikat » and certain American importers of potash salts, which was the occasion of diplomatic exchange between the Governments of the parties to the controversy, accentuated the fact that there were no known sources of potash salts of any economic importance in the United States. The possible resources of potash therefore received special attention and various lines of inquiry were actively prosecuted. One of these, so far, has yielded positive results. In 1909 attention was called to the giant kelps of the California coast as occurring in enormous quantity and being especially rich in potash salt.

PACIFIC KELPS INVESTIGATIONS.

Early in the summer 1911 three field parties were organized by the Bureau of Soils: Prof. George B. Rigg, Assistant Professor of Botany to the University of Washington, observed and mapped the kelp beds or groves in about a half of Puget Sound; Prof. Frank, McFarland, Instructor in Charge, Marine Biological Laboratory, Pacific Grove, Cal., surveyed the groves from San Francisco Bay to Point Sur; and Captain W. C. Crandall, of the La Jolla Station of the Marine Biological Association of San Diego, surveyed the groves of the main shore and outlying islands from point Loma to Point Conception. Officers of the Bureau of Fisheries made still further observations regarding the kelps of Alaska. Over 1000 square miles were thus surveyed, and it is believed that the total area on the Pacific Coast, from Magdalena Bay to Shumagin Islands, may possibly be 6 to 8 times this.

THE POTASH KELPS.

A large number of kelps and rockweeds were found, although generally the larger groves are approximately pure stands. Two of the kelps are chiefly of importance as sources of potash. In the northern groves the important kelp is *Nereocystis luetkeana* P. & R., and in the southern groves it is *Macrocystis pyrifera* (Turn.) Ag. From Point Sur southward this latter occurs in large groves sometimes several square miles in area, and often in very dense masses. *Nereocystis luetkeana* is the only species of the genus *Nereocystis* P. & R. and *Macrocystis pyrifera* of the genus *Macrocystis* Ag., both of the family Laminariaceae, subfamily Lessonioidae, the first of the tribe Lessoniae and the second of the tribe Macrocystae.

Nereocystis luetkeana grows in almost any depth of water, where there is a rocky bottom and also a strong tideway or otherwise continual movement of the water. *Macrocystis pyrifera* grows only on exposed coasts where there is also much movement of water, and practically at depths of from 6-10 fathoms. As the carbon dioxide and the oxygen necessary to the metabolism of the plant must be obtained from the dissolved gases in the water, a continually renewed mass of water must be available. This fact, probably, accounts for the difficulty encountered in trying to propagate artificially these algae under laboratory and aquarium conditions. A rocky bottom is essential for the holdfasts which these plants have instead of roots.

Nereocystis is an annual, its fruiting season being about over by the middle of July, and in order to maintain the groves this alga should not be cut before that time. Macrocystis is probably a perennial, or at least its life is more than a year, and if cut early in the summer, it is said to be able to regain its luxuriant growth in 40 days; at least two cuttings should be practicable. Further, its habit of growth, the spores forming on fronds well below the surface, tend to provide against its extinction or serious depletion; nevertheless, it would probably be wise to maintain a "closed season" for this alga also, and not permit more than two cuttings per season, thus insuring a sufficient fruiting to maintain the groves unimpaired. Some form of governmental protection or control of the groves is deemed necessary to their maintenance and efficiency.

HARVESTING OF KELPS.

The cutting and harvesting of these kelps is a detail of the industry which is in far from satisfactory shape. Several forms of cutters have been suggested and a few tried. This is, however, a mechanical detail which will presumably be settled soon, now that it has been shown to be worth while. It probably will not be practicable to cut the kelp more than 10 or 12 feet below the surface of the water, and in the case of the Macrocystis at least, a greater depth of cutting should not be permitted, in order to ensure fruiting and reseeding of the groves. For pure bulk, probably easily to be obtained by some proper method of gathering, Macrocystis excels all others, since it occurs in fairly deep water and is mixed only with two other kelps equally desirable, apparently, for harvesting.

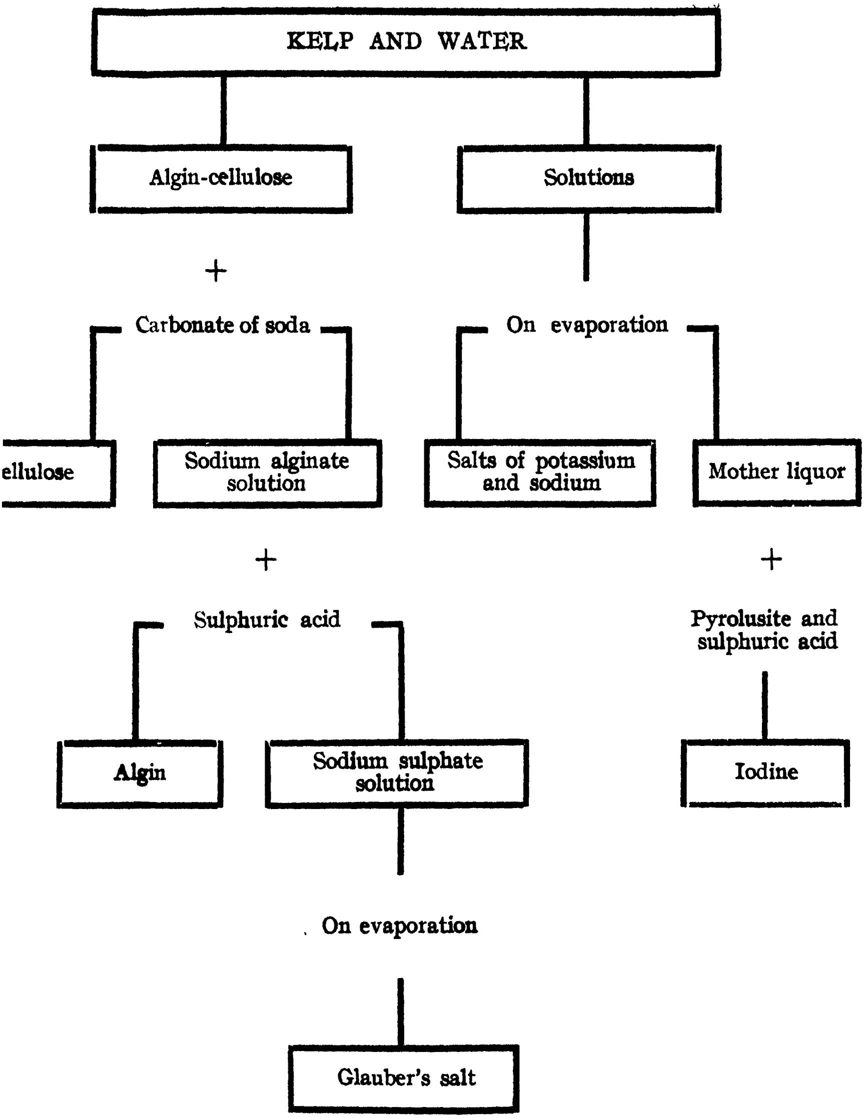
POTASH IN KELPS.

Kelp was originally a term applied to the ashes of seaweeds and rockweeds, but has become, especially in the United States, synonymous with the seaweeds or brown floating algae, and on the Pacific Coast is applied popularly to the two plants cited above. These plants, among other characteristics have this in common, they absorb relatively large amounts of potassium chloride from the sea water, much larger, it seems, than most other algae either of the Pacific or other waters. Dr. J. W. Turrentine of the Bureau of Soils has made a large number of analyses, and from his data it appears that Nereocystis contains about 30 per cent. of its dry weight of potassium chloride and Macrocystis nearly as much. With both kelps as they dry out, large quantities of potassium chloride, mixed with varying amounts of other salts, effloresce on the surface, and can be removed readily by simply shaking. Practically all the potassium sálts can be obtained by lixiviation of the dried plant or of its ash.

Neither Nereocystis nor Macrocystis of the Pacific Coast contains as much iodine as many other seaweeds and rock weeds; nevertheless, the amounts present are stated to be notable and contrary to popular belief, the southern kelp contains more than does the northern. According to Turrentine's analyses Nereocystis contains about 0.16 per cent. and Macrocystis about twice as much. Besides iodine, other useful products can be obtained, as alginic acid or "algin" and its derivatives to be employed in the textile and other industries, as well as human foods.

Although concordant results in the analysis of sea plants are scarcely to be expected, it will be of some practical interest to compare a few typical analyses from various parts of the world with those of the Bureau of Soils:

	Per cent. Potash
ANALYSES OF THE BUREAU OF SOILS:	
Nereocystis luetkeana	13.3-25.7
Macrocystis pyrifera	3.1-23
RUSSELL'S ANALYSES, BOARD AGRIC. & FISH.:	
Seaweeds from British Isles	2.16-5.88
CUNIASSE'S ANALYSES, FRANCE:	
Class 1	8.7-23
Class 2	11-18.2
KINCH'S ANALYSES, JAPAN:	
Porphyra and *Laminaria*	1.32-6.17
RHODE ISLAND EXPERIMENT STATION:	
Atlantic seaweeds	0.68-5.22


KELP AND WATER
Algin-cellulose
Solutions
+
Carbonate of soda
On evaporation
ellulose
Sodium alginate solution
Salts of potassium and sodium
Mother liquor
+
Sulphuric acid
+
Pyrolusite and sulphuric acid
Algin
Sodium sulphate solution
Iodine
On evaporation
Glauber's salt

TECHNOLOGY OF KELPS.

As regards the technology of the seaweed industry, at the present state of the question, it may suffice to give the following comparison of the three processes proposed : the heap-burning, the distillation, and the lixiviation.

HEAP-BURNING.

(Per cent. utilised, 18)

Ash, 18 tons	Salts, 9 tons . Iodine, 270 lbs.	Residuals, waste (valueless).

DISTILLATION.

(Per cent. utilised, 36)

Charcoal, 36 tons	Salts, 15 tons Iodine, 600 lbs.	Residuals: Charcoal (21 tons), tar and ammonia.

LIXIVIATION.

(Per cent. utilised, 70)

Water extract, 33 tons	Salts, 15 tons Iodine, 600 lbs.	Residues: Algin (20 tons), cellulose (15 tons), dextrin, etc.

Perhaps the more important is the lixiviation process, whose success would depend on the successful utilization of the organic matter remaining. This process may be schematically represented as follows shown on the annexed diagram:

PROSPECTS.

It is not possible as yet to give an accurate estimate of the amount of potassium chloride which the Pacific kelp groves can yield annually. With all conditions at their best the maximum possible yield might be in the neighbourhood of 8 000 000 tons, worth at present prices about $300 000 000. No such yield is probable, however, at least in the near future. Considering all possibilities and leaning strongly to conservatism, it appears practicable to obtain an annual yield of at least 1 000 000 tons of potassium chloride, worth at present prices upwards of $30 000 000. The iodine obtainable at the same time should go far toward paying the expenses of harvesting the kelp and extracting the potash.

It has been assumed in some quarters that because the kelp can be made to yield about three times the present total potash importations from Germany into the United States, the latter will be stopped or greatly diminished. This is very much doubted by Frank R. Cameron of the Bureau of Soils of the U. S. Department of Agriculture, in charge of the investigations. Existing business engagements, in fact, will ensure continued importation for some years to come. It is possible that potash from American kelps will reduce the price of potash salts. But the vast bulk of the potash salts goes into the South Atlantic States, because, as aforesaid, these States at present are the great fertiliser consumers. Inevitably the Trans-Mississippi States must also soon use fertilisers, and in fact the movement has already begun. The very large increase in the consumption of fertilisers, and therefore of potash, which we have above anticipated within the next few years, is probably enough to take up the American production in sight and the importation to be obtained from Germany as well.

PROVISIONAL SUMMARY.

I. The possible importance of the American Pacific kelps lies not in the probability of their excluding German potash salts.

II. But—

a) if properly managed, in preventing a monopoly and regulating prices;

b) in making possible an extended use of fertilisers, and thereby perhaps even stimulating importations;

c) in time of stress, giving to the United States home resources, and, it is hoped, preventing their agricultural interests from being at the mercy of an outside power.

III. These possibilities, however, are yet to be industrially realized on a large scale.

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(12) Reference list to the literature of the marine algae. — *Ib., Appendix T.*, pp. 277-290.

(13) Plates IX-XIX & Maps 0-18. — *Ib.*

(14) CAMERON, T. K. Potash from the Pacific kelps. — *The Journal of Industrial and Engineering Chemistry*, Vol. 4, pp. 76-77. Easton, Pa., 1912.

(15) ID. Waste and conservation of potash and phosphoric acid, *Discussion.* — *Ib., Mineral Wastes Symposium*, pp. 169-172.

(16) See *B.*: March 1912, No. 492; June 1912, No. 900.

PECK, S. S. **The Influence of Molasses on Nitrification in Cane Soils.** — *Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association. Agricultural and Chemical Series. Bulletin*, No. 39, pp. 22 + 8 charts. Honolulu, Hawaii, April 1912. **1148**

Hawaii

The utility of molasses in improving soils by promoting nitrification is still an open question. In a preceding series of experiments on a small scale, the Author had already found that molasses applied to land lying fallow or even several weeks prior to the planting of the sugar-cane may produce beneficial results by providing a stimulus to the nitrogen-fixing bacteria of the soil. But, when the experiments were repeated on ground already under cane it was evident that, in all instances, the molasses had a harmful effect by increasing the action of denitrifying bacteria.

In order, however, that the conditions should more nearly approach those of field practice, the Author repeated his experiments in 24 lysimeters, so that complete analyses of drainage waters were made. He was thus able to follow the formation of nitric nitrogen in the soil, applying respectively nitrate of soda, sulphate of ammonia aud tankage at the same time as:

a) a large application of molasses, 400 gallons per acre;

b) molasses in 10 small doses of 40 gallons per acre;

c) mineral matter contained in the molasses (in the proportions corresponding to *b*).

d) nothing.

From the results of 264 determinations, it was ascertained that the molasses worked a harmful effect on nitrate of soda, sulphate of ammonia and tankage and on all three together. Molasses used with nitrate of soda causes the transformation of the nitric nitrogen into less available or unavailable forms of nitrogen, it checks the nitrification of sulphate of ammonia dressings, and retards the ammonification and nitrification of the nitrogen of organic fertilizers. The harmful effect of molasses dressings is due entirely to the organic constituents of the molasses, the mineral matters having no influence. Consequently dressing with carbonate of lime does not correct such adverse action of molasses.

1149 EWART, A. J. **The Influence of Superphosphates on the Germination of Wheat.** — *The Journal of the Department of Agriculture of Victoria, Australia;* Vol. X, Part 4, pp. 256-258. Melbourne, April 1912.

Australia: Victoria

It has frequently been stated that when wheat lies in a dry soil for a long time in contact with superphosphate of lime, its germination may be seriously affected. Thus, the experiments of the Author as to the best depth to place the manure are of practical interest.

These experiments were carried out on small plots in which the grain and superphosphates were planted at exactly measured depths. This is necessary, because the very best drill varies a little in the depth at which the seed is planted, particularly where the seed-bed contains many stones or unbroken clods.

In the first series of experiments, dry wheat was stored with an equal quantity of dry superphosphate for three to six weeks and the germination noted at the end of those times. The following is the average of three series of four lots:

	Germination %
Control, 3 weeks	91
Superphosphate, 3 weeks	91
» 6 »	87

Evidently when the grain and the superphosphate are dry, little or no injurious effect is exercised in a moderate length of time.

In a second series of experiments, the grain and superphosphate were placed at different depths and the effect on the crops determined. There were 6 series of plots, the first control, the second with 2 cwt. superphosphate per acre, and the remainder with 1 cwt. superphosphate per acre respectively. Each of these series, further, was divided into three plots with respectively, grain and phosphate at a depth of 1 inch.; phosphate 2 inches, grain 1 inch.; and phosphate 4 inches, grain 1 inch. Summarising the results, the following comparative figures are obtained:

	Heads	Straw
	—	—
Grain and phosphate, 1 in.	89	686
Phosphate 2 in., grain 1, in.	103	703
Phosphate 4 in., grain 1 in	121	801
Control, no manure	27	240

With the exception of two series, the results in each series are consistent with the averages of the whole plots; thus placing the superphosphate from 1 to 3 in. below the grain seems to increase the yield, both as regards heads and straw. If the average of the plots receiving 1 cwt. of superphosphate per acre is taken and it is compared with the 2 cwt. plots they work out something like this:

	Heads		Straw	
	2 cwt.	1 cwt.	2 cwt.	1 cwt.
	—	—	—	—
Manure sown with seed.	16	18 ¼	144	135 ½
1 inch under seed	21	20 ¼	157	136 ½
3 inches » »	31	22 ½	228	143 ¼

Thus the manure placed as deep as 3 inches was an advantage all round, but the gain was much greater with the larger dressing In any case, further experiments to confirm these results would be useful, for if it were proved that deep drilling of the manure is advisable, the farmer would be enabled to use larger quantities of manure with profit than has hitherto been possible with the ordinary drill.

LUMSDEN, D. **Fertilisers for Carnations**. — *New Hampshire Agricultural Experiment Station. Bull.* 159, pp. 14 + 4 diag. Durham, New Hampshire, April 1912. **1150**

United States: New Hampshire

The commercial importance of the carnation as a florist's flower is well known. Upwards of ten million carnation plants are annually grown, and upwards of one hundred and twenty million carnation blooms, yearly, are cut and sold in the various markets of the United States and Canada. The flowers are estimated as selling at an average of $4 (16s 6*d*) per hundred, or $4 800 000 for the annual output.

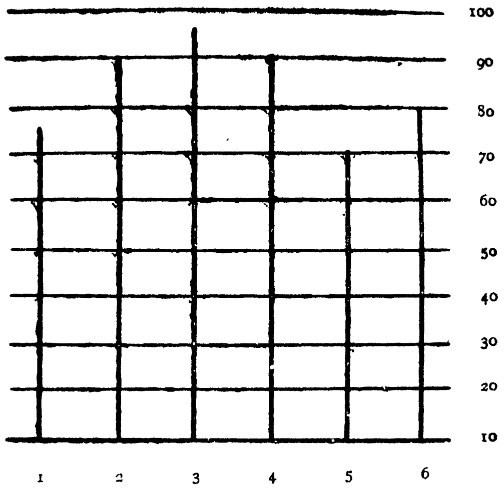
The Author, being familiar with the amount of capital invested in carnation culture, considered it of importance to make a study of the economic production of first grade flowers by carrying on an experiment with fertilisers, to ascertain if possible their value when applied as top dressings to carnation plants grown on raised benches in the greenhouses, at the same time to determine the difference in the keeping quality of flowers raised under the various treatments given.

The carnation plants used were seedlings raised from such commercial varieties as Enchantress, Queen, M. A. Patten, Harry Fenn, Lady Bountiful, Mrs. T. W. Lawson, and Governor Wolcott. The varieties were arranged in blocks in different parts of the houses, in order that comparisons could be made regarding the action of the different fertilisers on each variety. Check plots containing plants of each variety were arranged to ascertain the difference in growth where no manure was applied. The following manures were used: nitrate of soda, muriate of potash, bone meal, Clay's fertilizer (commercial compound fertilizer), hen manure. Plants were placed a foot apart, that is one per square foot.

The following table shows the amounts of manures applied to the various plots in houses Nos. 1 and 2. To the check plots of house No. 3 no manure was applied.

Plot No.	No. of plants	Bed No.	Ozs. per application.	No. of applications.	Total ozs. applied.	Area of plot: sq. ft.	Fertilizer
1	20	1	2½	8	20	20	Clay's Fertilizer
2	8	1	1	8	8	8	Muriate of Potash
3	40	1	3½	8	28	40	Nitrate of Soda
4	20	1	2½	8	20	20	Bone Meal
5	28	1	8	8	64	28	Hen Manure
6	24	1	16	8	128	24	»
7	32	2	8	8	64	32	»
8	32	2	8	8	64	32	Bone Meal
9	64	2	16	8	128	64	Muriate of Potash
10	64	2	16	8	128	64	Clay's Fertilizer
11	32	3	7	8	56	32	Bone Meal
12	72	3	19	8	152	72	Clay's Fertilizer
13	24	3	6	8	48	24	Muriate of Potash
14	24	3	6	8	48	20	Clay's Fertilizer

The following graphic illustrates the relative keeping qualities of the flowers on a scale of 100.



1. Where nitrate of soda was used
2. » muriate of potash » »
3. » bone meal » »
4. » Clay's fertilizer » »
5. » hen manure » »
6. » no fertilizer » »

The collected data may be summed up as follows:

I. The bone meal gave the best results. Its action was much slower than that of nitrate of soda or other nitrogenous manures, but the vigor of the plants and the keeping qualities of the flower were markedly superior to the plots treated with other manures.

II. Clay's fertilizer proved a good second fertilizer, the plant responding to the action of this manure more quickly than to bone meal alone. In keeping qualities the data show that those grown with this manure ranked second.

III. Hen manure proved a valuable manure when used in small quantities, but when used in excess it had a tendency to force the plants quickly into a weak growth, and greatly impaired the keeping qualities of the flowers.

IV. Muriate of potash did not compare favorably with either bone meal, Clay's fertiliser or hen manure. Results from the different plots treated were not uniform. The keeping qualities of the flowers were, however, excellent.

V. Nitrate of soda appeared the least valuable, although active growth of the plants was noticeable soon after this manure was applied. The plants treated with it did not show as much vigor and stability as with other manures, and the keeping qualities of the flower were not so good.

1151 Operations during 1910 and 1911, under the British Fertilisers and Feeding Stuffs Act, 1906.

1*. BOARD OF AGRICULTURE AND FISHERIES. Proceedings under the Sale of Food and Drugs Acts, 1875 to 1907, the Fertilisers and Feeding Stuffs Act, 1906, etc., For the Year 1910. — *Annual Report of the Intelligence Bureau,* Part I., pp. 118. London, 1911.

Great Britain

2*. ID., For the Year 1912.—*Ibid.*, pp. 112. London, 1912.

By the Fertilisers and Feeding Stuffs Act, 1906, the agricultural authorities are enabled to control the purity of these commodities, so that the consumer may be secured against gross and fraudulent adulteration.

In reviewing the administration of the Act by the Commercial Control Branch of the Board of Agriculture up to the 31st December, 1911, it appears that Analysts have now been appointed by all the Counties and by 48 out of the 107 County Boroughs and Burghs which are Local Authorities under the Act. Deputy Analysts have been appointed by 33 Counties and 6 County Boroughs and Burghs. Official Samplers have also been appointed by all the Counties and by 68 County Boroughs and Burghs.

The total number of samples of fertilisers and feeding stuffs taken during 1910 and 1911 were :—

	1910	1911
England :		
Fertilizers	931	1 300
Feeding Stuffs	1 721	2 064
Wales :		
Fertilizers	140	151
Feeding Stuffs	240	256
Scotland :		
Fertilizers	682	760
Feeding Stuffs	295	305
Total	4 009	4 836

Of this total—

3149 samples were taken by official samplers,
1417 » » » » private persons,

which is an increase of 795 official samples over the previous year. The operations under the Act seem to be uneven in the different parts of the country; thus in 1911 the samples taken in Kent were 301, in Worcester 332, in the small county of Monmouth 211, while in the large county of Lancaster they were only 5, in Cumberland 44, in Northumberland 1; so that apparently in the North of England little importance is attached to sampling.

The alleged contraventions of the Act reported by Local Authorities during 1911 amounted to 45, and in 35 of these cases the Board issued their consent to the institution of proceedings. The following are a few specimens of the list of the contraventions:— Fertiliser sold in small packets, invoice false as regards amounts of phosphate and potash; the percentages guaranteed were 22.08 and 0.85 respectively; the actual percentages were 4.42 and 0.31; seller fined £10 and costs. Superphosphate guaranteed 35 per cent. soluble; contained only 32.5; seller fined £10 and costs. Compound manure, serious deficiency in soluble phosphate; sellers had a bad record, fined £20 and costs. Fish guano, considerable deficiency in nitrogen; seller fined £5 and costs. Nitrate of soda, failure to give invoice stating percentage of nitrogen; fine 20s.

Finally, it will be of practical interest to reproduce the following schedule fixing the limits of error for fertilizers, as amended in 1910 and expressed in percentages of the whole bulk:

Description of Fertilizer	Limits of Error			
—	Soluble Phosphates	Insoluble Phosphates	Nitrogen —	Potash —
1. Superphosphate	1	—	—	—
2. Dissolved Bones:—				
I. When the total percentage of phosphates is stated 32 or more:				
a) If the excess of the actual percentage of insoluble phosphates over that stated is 3 or more	4	—	0.3	—
b) If such excess is not less than 2, but less than 3	3	—	0.3	—
c) If such excess is not less than 1, but is less than 2	2	—	0.3	—
II. In all other cases	1	1	0.3	—
3. Bone Compounds	1	1	0.3	—
4. Compound manures (other than Bone Compounds, but including Dissolved Guano):				
a) If the respective percentages of Nitrogen and Potash stated do not exceed 4	1	1	0.3	0.3
b) if such respective percentages exceed 4	1	1	0.5	0.5

Description of Fertilizer	Limits of Error			
—	Soluble Phosphates	Insoluble Phosphates	Nitrogen	Potash
5. Sulphate of ammonia	—	—	0.5	—
6. Nitrate of soda	—	—	0.5	—
7. Ground Hoofs and Horns	—	—	0.5	—
8. Dried Blood	—	—	0.5	—
9. Fish Guano and Meat Meal	—	2	0.5	—
10. All Cakes and Meals (other than Bone and Meat Meal)	—	—	0.5	—
11. Ground Bones and Bone Meal	—	2	0.5	—
12. Basic Slag and Basic Superphosphate	2	2	—	—
13. Shoddy, Wool, and Hair Waste	—	—	1	—
14. Kainit and other Potash Salts:				
a) Where the percentage of Potash stated does not exceed 15	—	—	—	1
b) Where such percentage exceeds 15	—	—	—	2
15. Nitrate of Potash	—	—	0.5	2
16. Peruvian and other natural Guanos:				
a) Where the percentage of insoluble Phosphate stated does not exceed 30	—	3	—	0.5
b) Where such percentage exceeds 30	—	5	—	0.5
c) Where the percentage of Nitrogen stated does not exceed 3	—	—	0.5	0.5
d) Where such percentage exceeds 3 and does not exceed 5	—	—	0.75	—
e) Where such percentage exceeds 5	—	—	1	0.5

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

1152 ANDRÉ, G. **The Evolution of Nitrogen, of Phosphorus and of Sulphur during and after the Vegetative Period in Barley.** (Sur l'evolution de l'azote, du phosphore et du soufre au cours de la végétation de l'orge). — *Comptes Rendus des Séances de l'Académie des Sciences*, Tome 154, No. 24, pp. 1627-1630. Paris, 10 juin 1912.

France

Isidore Pierre had discovered that, in wheat, the weight of the dry matter and of ash diminished from the time of flowering to that of maturity, and Joulie had found the same to be true for all cereals. Nevertheless these losses vary according to the plants cultivated, and they are besides so extremely irregular that sometimes they become gains. However the losses are absolutely conc stant as to potash and soda.

The author has endeavoured to verify, with the greatest possible precision, these losses in regard to certain substances, by making a series of determinations on Moravian barley cultivated under natural conditions on a uniform plot.

From the results obtained it appears that the dry matter increases regularly up to the time of complete maturity: July 20. On August 2, when over ripe the whole plant showed a loss of 11.2 % of dry matter. The content of phosphoric acid increases also regularly up to maturity (July 20) and does not diminish after this period. Sulphuric anhydride increases likewise up to maturity but afterwards diminishes slightly between July 20 and August 2, (2.70 %).

This shows that both phosphorus and sulphur exist in the organic molecules of the plant in a state insoluble in water and not diffusible (lecithin, nuclein, albuminoids), and that phosphorus is also probably in an insoluble state under mineral form (phosphates of lime and magnesia). This would explain why phosphorus does not diminish even after the point of maturity has been passed.

The nitrogen content increases regularly up to the period of maturity after which it undergoes considerable loss (16.4 %).

In conclusion the acid elements here considered show the maximum percentage at the time of complete maturity. This does not seem to be the case with the alkalis as the author proposes to demonstrate.

SELECTION.

BÖHMER. **The Importance of Morphological Characters in Classification and in Plant-Breeding.** (Ueber die Bedeutung morphologischer Merkmale für Systematik und Pflanzenzüchtung). — *Beiträge zur Pflanzenzucht*, Zweites Heft, pp. 65-73. Berlin 1912. 1158

The interpretation of external characters is of special importance in plant selection and can be carried out in two ways:

Germany

1) The separate analysis of all the characters, which is the surest method, but requires much time and exact and difficult technique.

2) The examination of correlations, which term includes two quite distinct things — the organic-functional relations, which are constant for each individual, and the variable relations, which the study of a larger number of individuals reveals from the ontogenetic and philogenetic standpoints.

The latter is the "correlation of variability" and it alone interests the selector.

From the most ancient times, it has been the habit to judge all living things, man, animals and plants, alike from their external aspect — their habitus, without seeking for possible relations. Thus, often what is merely the result of a common cause has been regarded as a correlation.

In the Agricultural Station of Göttingen, it has been possible to ascertain that the figures representing length of straw, resistance of the stem to bending and the weight of the grains, increase in proportion to the increase of the humidity of the soil. This relation, which alters with varying conditions of environment, can have no significance for the selector. Correlation, properly so-called, cannot be influenced by external agents; it arises in every individual and is transmissible. The numerous exceptions often mentioned must be referred to "mixed populations" composed of many elementary distinct types; if we limit the study to pure lines, these exceptions gradually diminish until they disappear. Nevertheless, many correlations considered hitherto constant are now proved by experience not to be so. Thus, Johannsen by selection and hybridizing for three consecutive generations, succeeded in obtaining in one variety of barley the characters of weight of ear and high nitrogen content, which were considered hitherto as allelomorphic.

These facts extend and increase considerably the field of selection, at the same time making ever more uncertain estimates based on correlative variability.

Thus, the direct analytic method is much superior to indirect selection by correlation. The latter can, at most, give an indication, a general idea of the complex value of a type, and has thus importance in initial selection and the classification of the material for selection. Where we hear that a variety of barley belongs to the type *erectum* we have from this fact a hint of its resistance to lodging, the size of the grain, and the requirements of the variety as regards soil and manure, that is to say information to guide us with sufficient precision through the labyrinth of the numerous and various kinds of barley.

In addition to this, it must be remembered that Nilsson-Ehle by means of unimportant external characters was able to foresee the mutations likely to appear and the possibility of effecting a cross which would add characters of special utility. The study of external characters is not only of importance as affording a rapid and secure means of classifying the different varieties, but also as revealing biological processes, regarding which we should have otherwise but meagre and doubtful indications.

Biffen, R. H. **Studies in the Inheritance of Disease Resistance. II.** (1). — *The Journal of Agricultural Science*, Vol. IV, Part 4, pp. 421-429. Cambridge, June 1912. **1154**

England

The F_2 generation of crosses between a number of varieties of wheat susceptible to the attacks of yellow Rust (*Puccinia glumarum*) and American Club, which shows an extraordinary degree of resistance to the attacks of this parasite, showed in 1906 obvious segregation into immune and susceptible forms. An analysis of these F_2 generations showed that the immune plants were present to the extent of 25 per cent, that is, that the property of resisting the attacks of yellow rust behaves as a recessive character to the property of being susceptible.

The plants which proved susceptible showed, however, very varied degrees of susceptibility. Many were as thickly covered with rust pustules as Michigan Bronze, others were relatively slightly attacked, and between these extremes all degrees of susceptibility appeared to exist. Since 1907, investigations have been carried on to determine whether the extracted immune types would breed true to the feature of immunity, and to attempt to find some explanation of the wide range of susceptibility shown by a portion of the F_2 individuals.

For the most part, the descendants of the cross " American Club " × " Michigan Bronze " were used. Two sowings were made in autumn and spring of each wheat year. In 1007 the rust did not appear till late (May 10th) and no statistical examination was made till June 22nd. At this date, the autumn-sown cultures were in full flower, while the spring-sown rows were tillering repeatedly and forming dense masses of foliage.

The following table shows the results of the examination of the first 36 cultures in detail:

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(1) See *B*. Nov.-Dec. 1911. No. 3234.

Number of Culture	Rust in F_2	Rusty plants in F_3	Immune plants in F_3
42/5 *G* 1	None	0	11
2	»	0	13
3	»	0	14
4	»	0	13
5	»	0	11
6	»	0	12
7	»	0	6
8	»	0	9
9	Medium	11	3
10	»	10	6
11	»	14	3
12	»	12	0
13	»	15	2
14	»	20	3
15	»	17	7
16	»	7	2
17	»	4	1
18	»	3	3
19	»	6	2
20	»	9	6
21	»	8	2
22	»	9	0
23	»	14	0
24	»	7	2
25	»	6	3
26	Extreme	19	0
27	»	20	0
28	»	16	4
29	»	12	0
30	»	9	1
42/5 *H* 1	Traces	0	57
2	Extreme	36	18
3	»	47	15
4	»	38	12
5	»	30	9
6	Immune	0	58

From this table the following facts are evident:

1) That the immune types of the F_2 generation breed true to that feature.

2) That some of the susceptible forms also breed true but others produce offspring showing segregation into susceptible and immune forms.

3) That the " medium " class are not necessarliy heterozygous.

4) Where segregation occurs the sum total of immune and susceptible individuals is again in the ratio of 1 : 3.

Some of the plants immune in the F_2 generation which were grown on till the present year, have completely retained their power of disease resistance.

The susceptibility of homozygous cultures, season by season, as compared with one another is the same. Thus, a " medium " culture marked 5 and an extremely susceptible culture marked 10 at the F_3 stage, earn the same marks in the F_4-F_6 stages.

The varying and probably constant degrees of variability seen in the F_2 and succeeding generations are due to factors which, by altering the metabolic processes of the plant, alter its power of resistance to disease. One of these factors is, without doubt, the action upon the plants of various artificial manures. For this reason, the following table, showing the incidence of yellow rust on the variety " Browick " grown at Rothamsted in 1910, is of interest.

(0 indicates almost complete freedom from rust, 12 an excessively bad attack).

Plots	Rust	Manures
4	1-2	None
5	2	Minerals
6	3	» + 200 lbs. ammonium salts
7	3-4	» + 400 » » »
8	3-4	» + 600 » » »
9	3	» and nitrate
10	6-7	Ammonium salts only
11	10	» » and superphosphate
12	6	» » » » and sulphate of soda
13	4-5	» » » » and sulphate of potash
14	12	» » » » and sulphate of magnesia
15	5	Minerals + 400 lbs. ammonium salts
16	9-10	» + 550 lbs. nitrate
17	3-4	Ammonium salts } alternating each season
18	0	Minerals
19	8	Rape cake
20	3	None

Various features can be recognized in the parent plants, which affect the plant's metabolism, such as a difference in the leaf area, in the time of maturing and in the root range of the young plants.

When segregation occurs, fresh combinations of these various features result and consequently new degrees of susceptibility arise.

In the case of the cross American Club × Michigan Bronze, the extreme of susceptibility is represented by the latter parent; but in many other crosses, the F_2 generation contains individuals far more susceptible to rust than the susceptible parent. A typical case is provided by Rivet Wheat × Red Fife. In the F_2 generation, the hybrids segregated into slightly susceptible and susceptible forms; but amongst the latter group were many individuals far more attacked then even the susceptible parent (Red Fife).

In this particular cross, the differences between the parents are unusually numerous, and many of them argue differences in the plants' metabolism. There is, for instance, a great difference in the rate of maturation, Rivet wheat being a very slow growing variety and Fife an exceptionally rapid one. The former produces the finest, the latter the poorest type of bread-making flour.

Whilst in the case of Yellow Rust, none of the cases examined indicate that susceptibility is due to the existence of more than one factor, this is undoubtedly not so where all diseases are concerned. This is shown by several crosses in which a disease new to each of the parents has appeared in the F_2 generation.

Thus, in the last five seasons, the occurrence of the sclerotia of *Claviceps purpurea* has been repeatedly noticed in the F_2 generations of the following crosses:

Rivet × Red King.
Sunbrown × Rivet.
Red Fife × Rivet and its reciprocal.
Rivet × Galician.

When Rivet was crossed, however, with *Triticum polonicum* or with *T. dicoccum* all the individuals remained ergot-free. The most that can be said for the present in this connection is, that Rivet wheat carries one of the two factors necessary for the production of susceptibility to the attacks of *Claviceps purpurea*. The other factor is to be found in some varieties of *Triticum vulgare;* but not in *T. polonicum* or *T. dicoccum*.

According to Pole-Evans (1) the F_1 generation of a cross between varieties respectively resistant and susceptible to Black Rust (*Puccinia graminis*) is susceptible, and uredospores taken from it can affect the resistant parent. We have no direct evidence as to whether the same phenomenon occurs with the Yellow Rust (*Puccinia glumarum*); and the immunity of rust-resistant parents grown close to severely rusted F_1 plants shows that any such " bridging " effect is negligible in open field culture.

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(1) See *B*. May 1911, No. 1528. (*Ed.*).

It is of great importance to obtain rust-resistant varieties which mature early and give abundant crops of good quality. In India, Yellow Rust causes very serious losses. Many of the English varieties show a considerable degree of resistance under Indian conditions; but if introduced they fail to secure a hold, because they mature more slowly than the native varieties. Such facts are probably the explanation of the economic failure of resistant types. Direct evidence that immunity gradually fails is lacking; in fact historical evidence goes to show that both the falling-off of immunity and the gradual advance of the parasitic properties of the rusts take place too slowly to influence the work of the plant-breeder.

HOWARD, A. and HOWARD, G. L. C. **The Production and Maintenance of Pure Seed of Improved Varieties of Crops in India.** — *The Agricultural Journal of India*, Vol. VII, Part II, pp. 167-174. Calcutta, April 1912. **1155**

British India

At the last meeting of the Board of Agriculture held at Pusa, in 1911, the whole question of the production and maintenance of pure seed of improved crops was referred to a Committee of the Board. The results of its enquiries may be summarized as follows:

Methods of obtaining improved varieties.

A. The study of selection and crossing with reference to the nature of the climate, which has considerably modified the usual pollination mechanism; for example, wheats cross to a far greater extent in the irrigated tracts of the Punjab, than in the damper regions of India. In the first case, the work of individual selection is rendered more difficult by the presence of heterozygotes of determined characters.

B. The introduction of foreign varieties. Imported seed should not be distributed before it has been tested in suitable experimental plots, and acclimatization experiments have been made:

The maintenance of pure types.

Great stress is laid by the Committee on the maintenance by the Botanist of each Province of a collection of the improved types introduced into general cultivation by the local Department. This collection will serve as a source from which pure seed can be obtained whenever it is necessary to restock the seed farms.

Distribution to cultivators.

This should be guided by the following main principles:

1. The desirability of concentrating the efforts of the Department on one or two well-defined problems at a time (*e. g.* the prevention of deterioration in the local varieties of cotton) rather than wasting its resources on indescriminate seed distribution.

2. The desirability of confining the work of seed distribution in any one tract, as far as possible, to *one* sort and of systematically replacing existing mixtures by this pure type. This would have the advantage of eliminating the injurious effect of cross-pollination and of producing in a short time a large supply of pure seed. The application of this last principle has already been attended with excellent results in the Madras Province. The replacement of the mixed crop by a pure Karungani cotton in the Tinnevelly District is a notable achievement: at the present time there are 80 000 acres of this cotton in the district.

Marketing the produce.

1. A single consignment in a large market or exchange is unlikely to attract much notice, unless special attention is drawn to it.

2. Single occasional consignments do not fetch the same price as produce of recognized value known to be regularly obtainable in large quantities.

3. That as in the future the marketing of this produce must be in the hands of local buyers and agents, it is advisable, when possible, to enlist their help and carry on this work with their cooperation.

1156 RIMPAU, W. **The Crossing of Cereals.** (Ueber Kreuzungsprodukte von Getreide). — *Beiträge zur Pflanzenzucht*, Zweites Heft, pp. 115-129. Berlin, 1912.

Germany

In this paper, the hybridizing experiments made by Rimpau a few years ago with such conspicuous success, both from the scientific and practical standpoints, are discussed at length from the Mendelian point of view.

I. BARLEY.

Two-rowed barley can be bearded or unbearded, black or white, and occurs in three forms: *nutans*, *erectum* and *zeocritum*. Hooded barleys, with rudimentary awns, must also be mentioned.

In the many-rowed varieties, the same distinction must be drawn between hooded and bearded and between black and white forms, also between four-rowed, short six-rowed and long six-rowed; which three latter correspond to the two-rowed *nutans*, *erectum* and *zeocritum*. Many-rowed beardless forms are unknown. A forking of the rachis occurs fairly frequently, but it is not yet known whether this character, when once acquired, is transmissible, as it is in the case of oats.

The hood is doubtless an abnormality in barley, but has become constant in some varieties. In the cross of *Hordeum Steudelii* (two-rowed, black, bearded) × *trifurcatum* (four-rowed, white, hooded) we have four pairs of allelomorphs, and hence the possibility of 16 different forms in F_2. These forms were isolated and some of them fixed, and two other beardless forms were obtained later.

The hybrids of the awned forms are interesting. Rimpau crossed the Hanna variety with beardless, white, two-rowed varieties with the object of obtaining a beardless form of *Hanna*. The first generation of hybrids (F_1) had poorly developed awns, which were confined to the lower spikelets (bud variability).

In 1903, the writer turned his attention to the beardless variety, which had not yet become constant, and selected 16 awnless forms, of which he sowed the seed in 1904. It was found that in 9 of the plants this character was constant and in 7 variable, the offspring of the latter being awned and awnless in the proportion 1 : 5. Proceeding in the usual manner with the work of selection, the probability of the appearance of the awns gradually decreasing, the writer obtained a constant awnless variety "grannenlose Hannagerste."

Crossing a two-rowed black awnless *nutans* with a two-rowed awned *zeocritum*, in the F_1 (1907) the black awnless *erectum* form was obtained. In 1908, in F_2 there were 66 black and 20 white plants: a ratio of 3 : 1 ; 61 awnless individuals, 23 awned and 2 hooded: again a ratio of about 3 : 1. The appearance of a hooded form is curious, and is due to atavism, as the male parent was derived from the cross *Steudelii* × *trifurcatum*. It is clear that the character of hoodedness, hidden in awnless forms, can reappear in crossing, although the awnless character is constant.

From all the work of Rimpau senior and continued by the writer, which is based on the modern biological theory of the value and possibilities of selection, we find that the distinctive characters of barleys on crossing behave as follows:

Dominant		Recessive
Unbranched	×	Branched
Hooded	×	Awned
Awnless	×	Hooded
Black	×	White
Violet	×	White
Black	×	Violet
Two-rowed	×	Four-rowed
Two-rowed	×	Six-rowed
Four-rowed	×	Six-rowed

II. WHEAT.

As regards the hybridization experiments with different varieties of wheat, the following conclusions can be drawn:

Absence of awns and thinness of the ears are dominant in respect to awns and density of the ears.

Red is in some crosses dominant, in others recessive and again in others, intermediate.

The same may be said of the presence of hairs on the ears.

If much of the material collected and used by Rimpau did not yield very practical results, this is due to ignorance of Mendels' laws and to the faulty application of individual selection. After this explanation, we may give the following conclusions:

1) No crosses should be made with parents which do not possess marked and constant characters, that is to say, only individuals of pure lines should be chosen.

2) Every crossing should be at once followed by individual selection, to isolate the forms.

3) No intermediates should be used in breeding, as such continue to vary longest.

4) Heterogenous crosses can be made, although the resulting products are fixed with difficulty.

5) The chance of natural crossing is very slight. During 35 years, 30 varieties of wheat were grown near one another and only in 12 cases did cross fertilisation take place. In the same way, 50 kinds of barley were cultivated in close proximity for 25 years, which allowed of the possibility of 1200 crosses; but only 19 cases of natural hybridization occurred.

KRAUS, C, **The Standing-Power of Cereal Straws.** (Die Standfestigkeit der Getreidehalme). — *Beiträge zur Pflanzenzucht*, Zweites Heft, pp. 14-31. Berlin, 1912. **1157**

Germany

The standing-power of cereal straws (that is resistance to causes producing lodging) is, without doubt, a characteristic of the greatest importance and the production of resistant varieties is an object of special consideration in selection.

Mature and dry stalks are generally taken for estimating this power of resistance, and the estimate is based on certain external characteristics, or on certain properties, expressed in figures, which stand in more or less close relationship to one another. Correlation in this case is of the greatest importance in the determination, but much caution must be used in view of the many indirect sources of error which accompany these determinations.

The relative weight of the straws, which is in direct relation with the number of sclerenchyma cells determined in transverse sections, is by itself a fairly exact index of mechanical resistance; but it is not absolutely exact, in so far as it does not give any idea of the structure or arrangement of the mechanical tissues.

The best results have been obtained by tests of the bending of the stem by which the complex action of the mechanical factors is measured, that is to say, the resistance to bending and strain. Even in this case again, we have not sufficient data to be able to calculate the conditions of equilibrium at a given moment, as these vary according to the position of the centre of gravity, which is determined by the leaves, their points of insertion, the weight of the ears, etc. Once all these values were obtained, it would be possible to determine in the case of every plant the optimum degree of the characteristics of stability (the resistance of the root system) by making bending experiments on the standing crop. When these complex experiments have been made from the results compared with the equilibrium values at the different times, it will be possible to express numerically the mechanical resistance of the plant also during its vegetative growth.

It is true that the number of data required is large; but the method is nevertheless practicable and permits of an answer being given to the many questions relating to the resistance of plants to lodging.

Although numerous correlations will often permit of deductions concerning the complex structure of the plant being made from the study of a single factor, the method which entails a careful examination of all the factors is always the best and the most certain. In selection, it is always indispensable to know the value of the single " quality " and of the single " character "; in order to be able to eliminate or unite them in the required proportion. The determinations should be made not on one, but on many plants, and continued for several years, under the most varied meteorological conditions, with the object of uniting in the same group all the examples which, in the same conditions of environment, show an equal power of resistance to lodging.

Lastly, it is necessary to remember that such resistance must not be separated from the capacity of yielding a large crop of good quality. Many characters which contribute to the elasticity and strength of the straw are in correlation with a scanty yield of grain. Further, the stalk serves for the transport of matters from the root, and until the straw is ripe, it acts as an organ of assimilation.

Too large an amount of sclerenchyma would necessarily be injurious to the life of the plant. It should be in proportion to the mechanical (supporting) tissues and to the vascular and assimilating tissues. To obtain this optimum proportion is the aim of selection in its work of creating varieties which stand up well and at the same time produce abundance of grain of good quality.

1158 BURTT-DAVY, JOSEPH. **An Early-Maturing Hickory King.** — *The Agricultural Journal of the Union of South Africa,* Vol. III, No. 5, pp. 675-677. Pretoria, May 1912.

Union of South Africa

For some years the writer has been endeavouring to produce an early maturing 8-row Hickory King maize. It is generally recognized that such a mealie would do much to increase the yield of maize on the high veld, because it would lengthen the planting season and reduce the losses from early frosts which at present seriously reduce the crop.

By selection of early maturing individuals and by crossing, the writer has succeeded in producing a vigorous, pure white Hickory King (typical 8-row) which, planted in the middle of October, 1911, was dead-ripe and harvested on 15 February, 1912, and was safe from frost at least two weeks earlier. There was only one plant of it, and this was self-fertilized. The plant came from an ear of Hickory King × Black Mexican of which most of the grains were black, though of the true Hickory shape; the white ones (*i. e.* recessive) have bred true to colour. The grains of the ear are to be planted next season and the crop studied for possible variations.

WITTE, HERNFRID. Multiplicity of Forms in the Most Important Forage Grasses. (Om formrikedom hos vara viktigare vallgras). — *Sveriges Utsädesförenings Tidskrift*, Argang XXII, Häfte 2, pp. 65-118. Malmö, 1912. **1159**

Sweden

Multiplicity of forms and transmissibility of varying characters are indispensable requisites for success in the work of selection and improvement of cultivated plants. The experiments in the selection of forage grasses at Svalöf were guided by this principle.

In fields and pastures in various localities of Sweden a number of individuals of each species were collected; these were planted at Svalöf, and reproduced vegetatively. The individual plants distinguished by the name of " Ursprung-Individuen " or " Ursprung-Nummer " were studied for many years in succession. To allow of determining the inheritance of various characters experiments were made in the following manner: The seeds from various " Ursprungsindividuen " were collected and sown separately in pots. From a study of the plants which germinated from these, the Author was able to observe that all the anatomic characteristics comprised in the examination vary within rather wide limits and may present themselves in the most divergent combinations. Each combination is a form. The Author however is little concerned with these forms; he rather endeavours to bring out clearly the direction in which the plants tend to vary. The following species were chiefly studied: Timothy (*Phleum pratense*), Cocksfoot (*Dactylis glomerata,*) Meadow Fescue (*Festuca pratensis*) and Tall Oat (*Avena elatior*).

The Author takes into consideration the variations both of anatomical and of physiological characters.

Length of culms. — As regards the length of the culms there are noteworthy differences between the " Ursprung Individuen " (first parents) of one and the same species, especially in timothy. The inheritance of various gradations of length of culm has likewise formed the subject of careful enquiries, indicating for some of the progenies a noteworthy uniformity and for others again manifest evidences of divisibility. The length of the culm is of some practical importance, because it stands in direct relation to the yield.

Branching. — In the perennial grasses the branching may be tufted or by stolons, with graduated transitional forms. The species studied are all tufted; in other grasses on the other hand, for instance *Agrostis stolonifera*, there are forms with underground stolons and others with stolons above ground, the length varying greatly; a like want of uniformity is also observed in Foxtail (*Alopecurus pratensis*).

Direction of the leaf buds. — There are buds which develop sometimes vertically, sometimes horizontally, the most diverse conditions being combined in one and the same plant, with all possible gradations between the one form and the other.

Form of the blade. — The form of the blade is varied. The length and width vary within very wide limits and present the most diverse combinations. These diverse gradations of form are inherited, but it is not always possible to ascertain with certainty whether or no it is a question of simple fluctuations.

Colour of the leaves. — The colour of the leaves, or still more the colour of the entire plant, may vary greatly: yellowish green, light green, dark green, greyish green, blue green. These colours would represent inherited gradations of the green colour. Cocksfoot and sheep's fescue not infrequently present the phenomenon of albinism.

Hairs and their distribution. — The distribution of the hairs in the various forms of cocksfoot and tall oatgrass is very various. There are forms with the leaf-blades glabrous or nearly so, others with long and fine hairs, others again with close and rough hairs. The first generation of a specimen of cocksfoot with long fine hairs represented by 52 individuals exhibited 48 similar to the parent plant and the remainder with rough, hairless limbs. There is doubtless a phenomenon of splitting up of the characters here in question.

Axis of the inflorescence. — It varies in dimensions, shape and resistance. The various gradations in length are hereditary. Hence the importance of the work of selection of this character, which is in direct relationship to the yield of seed. Preference should always be given to inflorescences with a well-developed axis.

Generally the form of the axis is cylindrical. At times however it tapers distally, *i.e.* the transverse section of the culm diminishes towards the apex, or proximally, that is, the transverse section of the culm diminishes towards the base. The branches of the inflorescence in timothy are fused with the axis and only in rare cases do they emerge freely in part. This latter property would appear to be hereditary.

For cocksfoot there are various types of axes with panicles characterised by:

(*a*) the length of the axis;
(*b*) the length and direction of the primary branches;
(*c*) the rigidity of the principal axis and its branches;
(*d*) the bulk of the groups of spikelets.

The shape, dimensions, colour, and length of awns of the glumes and the shape and size of the fruits, also display considerable variations.

Among physiological characters undoubtedly resistance to cold is that of most practical importance. In the species studied this degree of resistance is highly uniform. Only for cocksfoot in the winter 1908-09 were specimens found distinguished by a special resistance.

The *development* also exibits noteworthy variations. All the species have early and late forms. This character is hereditary, though frequently phenomena of splitting up of the characters in the progeny are observed.

Resistance to rust. — The Author on this point reports the results of numerous observations and assumes the inheritance of this character. In one and the same species there are individuals highly subject to the disease, others almost immune. *Uromyces Dactylis, Puccinia Phlei-pratensis, P. Arrhenatheri, P. coronifera* f. sp., *Festucae, P. perplexans* and *P. Poarum* are the most widespread species of the *Puccinia,* group of *Uromyces* which attack forage grasses.

Withering of the leaves after flowering, during the autumn period, varies in the different forms of one and the same species. Thus cocksfoot gives us on the one hand rapidly withering forms and on the other forms which remain green and exuberant until past the end of autumn.

The possibilities and objects of the selection and improvement of forage grasses.

All the species here considered are typically allogamous, and therefore the material is always formed by hybrid individuals, the descendants of which may be uniform with respect to one character and non-uniform with respect to another. The main object of selection is to obtain new types which combine a high yield with the utmost possible uniformity in regard to certain characters: period of growth, resistance to cold, resistance to rust, etc. The results hitherto obtained at the station of Svalöf show that the most common species of fodder grasses are susceptible of substantial improvement.

WEINZIERL, [v.]. **Latest Rules and Regulations of the Seed-Testing Station of Vienna.** (Regeln und Normen für die Benutzung der K. K. Samen-Kontroll-Station in Wien). — *K. K. Samen-Kontroll-Station in Wien,* Publ. No. 422, 31 pp. Wien 1912. **1160** **Austri**

Purchase of Seeds. — The purchase of lots of seed must be made wholesale by agricultural societies or associations, so that small farmers may likewise benefit by the advantage of gratuitous testing of the seeds. The supplying firms must guarantee their goods, likewise taking upon themselves the expense of examination, in respect of lots of not less than 5 kg. (11 lbs).

The guarantee is for genuineness, purity and germinating capacity generally, and especially: the absence of dodder in clover, linseed and timothy (*Phleum*); the absence of American seeds in lucerne and red clover and of burnet (*Poterium Sanguisorba*) in sainfoin.

Examination. — In the presence of two witnesses a sample of the lot of seeds is taken straightway on receipt and is forwarded to the Station for test, accompanied by a duly filled in guarantee form.

The deviation from the guaranteed value must not exceed 5 % otherwise the firm owes or pays an indemnity or takes back the goods, or must supply a certain quantity of good seed.

The reduction in price of the lot is calculated by the following formula:

$$Ab = \frac{Pr}{100 \times Gb} \times V \times Q$$

in which:

Pr = Price per 100 kg. (220 lbs.).
Gb % = Actual guaranteed value.
V (% of Gb) = Percentage of variation.
Q = Quantity sold (in kg.).
Ab = Crowns (1 crown = 10*d.*).

Supposing that a lot of alsike clover is guaranteed 98 % purity and 95 % germination capacity, that is an actual value of 93.1 %; from the examination tests there is found on the contrary, purity: 94.7 %; germinating capacity 86.5 %; the actual value is then 81.9 %, adding 5 (percentage of latitude) to this, we have 86.9 %. Between the guaranteed value and the actual value there is thus a difference of 6.2 % to be made good. If the price per 100 kg. be 220 crowns (£4, 16*s.* 8*d.* per cwt.) and 26 kg. (57 lbs.) be the quantity sold, we shall then have, according to the foregoing formula:

$$\frac{220}{100 \times 93.1} \times 6.2 \times 26 = 3.80 \text{ crowns } (3s.\ 2d.).$$

The firm must therefore refund this sum to the purchaser.

Sale of already tested seeds. — There are firms who market lots already tested by the central station, in sealed packets. It should always be noted that the words: " K. K. Sâmen-Kontroll-Station in Wien " are impressed on the lead seal.

Mixtures of seeds. — The mixtures of seeds put on the market almost always represent poor quality goods; it is therefore advisable to buy the various species of seeds separately and under guarantee, and mix them afterwards according to the use to which they are to be put.

Table of limit values and average values. — In the following table are recorded the limit values and the average values for the seeds of the most important cultivated plants.

By *limit value* is meant the figure to which, after examination, the usual latitude percentage is not to be added; on the basis of which every one per cent less must therefore be made good. By *average value* of purity, germination capacity and actual value (Gebrauchswert) are meant the average values determined by the measurements and testing carried out in the station during the last ten years. For this of course the latitude of 5 % is retained.

Forage plants:

Forage seeds	Limit value			Average value		
	Purity %	Germination capacity %	Actual value %	Purity %	Germination capacity %	Actual value %
Red clover (*Trifolium pratense*) . .	96	83	80	97	88	85
White clover (*Trifolium repens*). .	95	72	68	96	77	74
Alsike (*Trifolium hybridum*) . . .	95	80	76	96	85	82
Lucerne (*Medicago sativa*)	96	83	80	97	88	85
Serradella (*Ornithopus sativus*) . .	93	70	65	94	80	75
Timothy (*Phleum pratense*)	95	85	81	97	90	87
Rye-grass (*Lolium perenne*). . . .	95	77	73	95	82	78
Italian Rye-grass (*Lolium italicum*)	92	74	68	95	77	73
Cocksfoot (*Dactylis glomerata*) . .	75	78	59	77	83	64
Foxtail (*Alopecurus pratensis*) . .	70	55	39	75	62	47

Cereals:

Species	Percentage by weight of impurities				Hard grains %	Soft grains %	Water contents %	Percentage of glume	Germination capacity %
	Earth, husks, broken seeds, foreign seeds.	Corncockle, darnel, cow-wheat, yellow-rattle.	Sclerotia of ergot (*Claviceps purpurea*).	Total					
Wheat . . .	0.3	0.1	0.1	0.5	40	—	15	—	95
	1.8	0.1	0.1	2.0	45	—	15	—	—
Rye	0.3	0.1	0.1	0.5	—	—	15	—	95
	1.8	0.1	0.1	2.0	—	—	15	—	—
Barley . . .	0.3	0.1	0.1	0.5	—	80	15	11	95
	1.8	0.1	0.1	2.0	—	85	15	11	95
Oats	1.3	0.1	0.1	1.5	—	—	15	30	90
	2.3	0.1	0.1	2.5	—	—	15	35	—

The contents of glume are expressed in percentage of the weight of the dry substance.

1161 WEINZIERL, T. [v.]. **The Work of the Seed-Testing Station of Vienna in 1911.** (31 Jahresbericht der K.K. Samen-Kontroll-Station in Wien für das Jahr 1911). — *K.K. Samen-Kontroll-Station in Wien,* Publ. Nr. 421, pp. 1-60. Wien, 1912.

The recently published Year Book for 1911 of the Seed-Testing Station in Vienna contains many interesting and instructive facts.

Austria The number of analyses during the year amounted to 33 103, and a considerable part of them were made upon application and on material forwarded by the principal seed-growing firms.

These firms acquired, by special contract, the right of having their seeds examined at half tariff rate, buyers absolutely refusing now to dispense with this test.

Determination of Dodder. — For this purpose there were subjected to examination 7 146 samples (in 1910 only 5483) of seeds of leguminous forage plants, dodder being found to be present in quite 2 272 samples (*i.e.* 31.8 %). This percentage is in excess of the average for the last ten years, and is due to the appearance and rapid spread of *Cuscuta suaveolens* Ser. and *C. arvensis* Beyr.

Linseed. — 26 samples were examined. In 13 out of these the test for dodder gave negative results. In the remaining specimens the determination of the purity and germinating capacity gave the following results:

Purity: minimum 91.4 %, maximum 99.7 % ; average 97.4 %. Germination capacity: minimum 89 % ; maximum 94 % ; average 90.9 %.

Cereal Seeds. — Number of analyses 1102, for determination of purity, germination capacity, weight per hectolitre, absolute weight of the grain, etc.

Seeds of Forest Tree Species. — The germinating tests for the 19 samples forwarded yielded the following results:

	Germination capacity 1911			1910	1909
	Minimum	Maximum	Average	Average	Average
Picea excelsa	16	58	43.0	74.0	66.4
Pinus silvestris	40	72	60.4	32.3	64.8
Pinus austriaca	35	84	63.3	72.0	65.0
Larix europaea	35	40	37.0	45.8	33.7
Pinus Strobus	—	—	45.0	75.0	81.0
Alnus incana	—	—	17.0	—	6.0
Fraxinus americana . . .	—	—	41.0	—	—

Field Experiments. — Experiments in the open soil form one of the most important parts of the work of the Station, completing its analytic work and likewise giving it the character of an experimental station at the service of agricultural practice and science.

The total area of the field annexed is about four-fifths of an acre. The central part, completely cleared of trees for an extent of 16 rods, is subdivided into plots devoted to the work of selection of cereals, leguminous plants and grasses. During the past year the following fertilising mixture was adopted: 3 ½ lbs. bone flour, 3/4 lb. potash salt, and 3/4 lb. nitrate of soda per rod. Demonstration cultures were carried out with 9 types of barley, 5 of oats, 1 of spring wheat, 20 of winter wheat, 13 of winter rye and 1 of summer rye.

Comparative cultures were also carried on with 11 kinds of maize, 22 of potatoes, 4 of turnips, 1 of mangels, with *Trisetum, Trifolium parviflorum, Trifolium suaveolens,* etc.

The seeds required for the experiments were obtained from plants grown in the preceding year, and for seed culture use was made of 300 small germinating discs, one for each species.

The beneficial effects of this manifold work of the station become more manifest every year in a progressive improvement of the sowing material, with a notable reduction both in adulteration and in the percentage of seeds of less appreciated varieties and of weeds.

ER EAL AND PULSE CROPS.

1162 UNSTEAD, J. F. **The Climatic Limits of Wheat Cultivation, with Special Reference to North America.** — *The Geographical Journal*, Vol. XXXIX, Nos. 4 and 5, pp. 347-366 and 421-441. London, April and May 1912.

Among the physical controls limiting wheat cultivation, climatic conditions are of the greatest importance, for soil conditions exercise a more limited and local control, and are more amenable to human modification; the two chief climatic factors are heat and moisture.

CONTROL BY HEAT CONDITIONS.

The limits of wheat cultivation equatorwards are set either by lack of moisture or by the fact that some other crop, *e. g.* maize, giving a higher return, is grown; consequently the minimum and not the maximum conditions are here considered.

The method adopted to determine the limits is to work out the actual requirements of wheat, and to compare these data with the temperature-conditions in other regions beyond the present area of wheat cultivation. For this purpose the method of calculating accumulated temperatures by "day-degrees" has been used; such results can only be considered empirical, but they seem to be useful for the problem under consideration.

Taking the temperature of 5° C. as the lower limit of growth, this method is applied to the records of temperature and dates of sowing and harvesting wheat at five experimental farms in the Dominion of Canada. Only spring varieties are considered, as near the limits of growth the winters are too severe for autumn-sown wheat to succeed.

The average for 1895 to 1905 with Red Fife at Ottawa gives an accumulated temperature of 1330° C. Considerable variation is shown by different varieties: thus Russian Ladoga at the same place required 120° C. less, and Early Riga, obtained by crossing a

Data for Spring Wheat.

Locality	N. Lat.	Date of sowing	Date of reaping	Days of growth	Accumulated temperature	Mean temperature
	°				deg. C.	deg. C.
Copper Centre, Alaska. .	62	May 10	Aug. 14	96	734	12.6
Sitka, Alaska.	57	» 3	Sept. 17	137	841	11.1
Dunvegan, Canada . . .	56	April 15	Aug. 15	122	930	12.6
Vermilion, Canada . . .	58	May 8	» 27	111	948	13.5
Chippewyan, Canada . .	59	» 20	Sept. 20	123	974	12.9
Nappan, Canada	45	» 8	Aug. 28	112	1 093	14.7
South Vologda Russia .	60	March 19	» 27	100	1 100	16.0
Agassiz, Canada.	49	April 16	» 15	121	1 120	14.3
Kostroma, Russia . . .	58	May 21	» 27	98	1 135	16.6
Ufa, Russia	58	» 21	» 27	102	1 157	16.3
Viatka, Russia	57	» 22	» 27	97	1 171	17.1
Fargo, U. S. A.	47	April 29	» 8	102	1 191	16.7
North Simbirsk, Russia .	55	May 11	» 17	98	1 251	17.8
Indian Head, Canada . .	50	April 24	» 28	126	1 293	15.3
Bozeman, U. S. A. . . .	46	May 1	Sept. 3	125	1 293	15.4
Brandon, Canada	50	April 28	Aug. 26	120	1 294	15.8
Poltava, Russia	50	» 12	» 1	111	1 297	16.7
Ottawa, Canada.	45	» 24	» 11	108	1 330	17.3
Don Territory, Russia . .	49	» 11	July 27	107	1 387	18.0
South Samara, Russia .	52	May 8	Aug. 13	97	1 390	19.4
Voronezh, Russia	52	April 21	» 6	107	1 406	18.1
Bessarabia, Russia . . .	47	» 12	» 1	111	1 436	18.0
North Taurida, Russia .	47	March 26	July 27	123	1 469	16.9
St. Paul, U. S. A. . . .	45	April 7	Aug. 7	122	1 509	17.3
South Kherson, Russia .	49	March 31	» 1	123	1 547	17.6

variety from Archangel with one from the Himalayas, required 180° C. less. For this reason the standard variety of each district is used in the comparisons made below.

A comparison of the accumulated temperature required at Ottawa with the same figure for other stations in Canada and in Alaska and Russia shows that the result from one locality cannot be applied to others (see table, p. 1761).

A study of these data also shows that the differences in accumulated temperature are quite independent of the length of the period of growth; on the other hand they have a distinct relationship to the mean temperatures (calculated by dividing the accumulated temperature by the number of days of growth and adding 5°). This relation is not absolute; and a consideration of some of the places with nearly equal mean temperatures, but with considerably different accumulated temperatures, *e. g.* Copper Centre on the one hand and Dunvegan on the other, and Viatka against North Taurida, suggests that differences in latitude may be responsible for the lack of agreement, smaller accumulated temperatures being required in higher latitudes; this is no doubt due to the greater length there of the summer days.

To examine the influence of this factor, the mean daily duration of light during the period of growth was calculated; to make the correlation more simple, the mean duration of *darkness* is taken, for then the factors accumulated temperature, mean temperature and duration of darkness vary in the same direction. An empirical "index number" has been obtained by adding the mean duration of darkness to the mean temperature. On plotting the figures from the various stations (see diagram), it is seen that this index number has a very close relationship to the accumulated temperature required, especially near the limits of growth of wheat.

Further points to be determined were the dates in spring and autumn at which the calculation of accumulated temperatures may begin and end: for this purpose data obtained at Sitka (Alaska) were found useful, as there the growth of several varieties tried was stopped in autumn before they were ripe. These show that sowing could be begun soon after the mean temperature reached 5° C., and that ripening could still take place when the mean had fallen to about 10° C.; these figures are therefore used in the determination.

Another point is the occurrence of summer frosts, which may kill the crop before ripening is complete; experience has shown that bringing land under cultivation greatly reduces these, so that

it appears that they will generally eventually cease to be effective; consequently they are not taken into consideration here.

It is therefore concluded that *wheat cultivation is possible at stations where the degrees of accumulated temperature, which is experienced between the dates when the mean temperature curve rises above 5° C. in spring and descends to 10° C. in autumn, amount to the number indicated by the straight line in the diagram as that required under the conditions of mean temperature and duration of light during the same period at the respective stations.*

This conclusion, when tested by application to places where wheat-growing has been attempted under unfavourable conditions, appears to agree with the facts.

The method has been applied to all the Dominion of Canada east of the Rocky Mountains; it appears that wheat-growing could be considerably extended in the North-West (Alberta), reaching as far as Fort Simpson along the valley of the Mackenzie river; from here the line showing the approximate limit descends rapidly towards the east, including however Lake Winnipeg, and comes nearly to the north shore of Lake Superior; from here it again rises, reaching the extremity of James Bay, after which it falls again eastwards and touches the mouth of the St. Lawrence river about long. 68° W. The large area thus included in upper Ontario and Quebec is, however, mostly unfit for wheat owing to the nature of the glacial soils occurring there.

CONTROL BY RAINFALL CONDITIONS.

The problem of ascertaining the minimum rainfall conditions of wheat cultivation may be approached by calculating the amount of water needed by wheat in a semi-arid region. In Utah, this has been shown to be 750 parts by weight of water for the production of one part of dry matter. A 10-bushel crop (which is considered paying in the semi-arid parts of the United States) means 1275 lbs. of dry matter per acre; the water necessary for this is 427 tons per acre, equivalent to 4.2 in. of rain. Owing to the plant being able to take up only about 90 % of the soil water, and to some loss by transpiration of the ripe standing crop, the minimum requirement for the plant itself may be taken as 4 ½ to 5 inches. A case is known in which a moderate crop was matured in New South Wales with only 5.32 in. of rain during the period of growth and the month preceding sowing, of which only 4.5 in. would be available to the plant; so that taking into account the use of drought-resitant varieties, such as durum or macaroni wheat, this allowance may be considered sufficient.

In semi-arid regions where the winter is not too severe, autumn-sown wheat is preferable to spring-sown, as it has a longer period in which to take up water and nutriment from the soil. Where wheat is planted in spring, the conservation of moisture by the methods of dry-farming becomes exceedingly important. But the most careful methods will not retain all the rainfall for the disposal of the crop, so that the mean annual rainfall must be more than the 4 ½ or 5 inches required by the plant itself.

Examination of actual conditions shows that wheat has long been grown in California with a mean annual rainfall of 10.3 inches; here the crop is in the ground from September (or later) to May. In Kansas, on the other hand, until the introduction of dry-farming methods, the margin of cultivation was found where the rainfall averaged 19.8 in.; here the crop was grown from March to the end of June, and consequently with higher temperatures than in California. Further, the rainfall in California is almost entirely during the cooler months, while over the Great Plains 70 % falls during the hottest months. It thus appears that these two types of climate ("Mediterranean" and "continental" respectively) must be considered separately.

Comparison with Turkestan and part of Victoria (Australia), both with "Mediterranean" climates, confirms this average of 10 in. It must further be remembered that certain years may have falls considerably below the average; for instance at Merced in California, which has an average rainfall of 10.3 in., there were between 1892 and 1909 years with as little as 6.3 and 7.0 in.

The conclusion is that *in regions of the Mediterranean type a mean annual rainfall of 10 inches is adequate for wheat cultivation, and where specially favourable circumstances obtain, such as lower temperatures or a very suitable soil, this amount may be reduced by one or even two inches.*

Consideration of regions with a continental type of climate leads to the conclusion that *a mean annual rainfall of 11 inches will be adequate over the northern part of the Great Plains of the United States*; consequently it is probable that a greater amount would be required in the more southerly portions; on the other hand, somewhat less than 11 inches would probably be adequate in the Canadian part of the area.

As the lowest known rainfall in that part of Canada is 12.2 in., it appears that wheat cultivation will be possible over the whole of the semi-arid region of southern Alberta and Saskatchewan, of course with the adoption of suitable methods, including summer-fallowing and the use of drought-resistant varieties.

The praticability of wheat-growing in regions with 11 in. of rainfall does not necessarily follow; for trees and forage-plants cannot be helped by the summer-fallowing method; and the former are often necessary to act as wind-breaks to prevent blowing of the soil, and the latter for feeding the stock necessary for the farm. Further, water must be obtainable for stock and for domestic purposes. In some cases the obtaining of a little underground water to supplement the rainfall in years of exceptional drought may be of great importance.

In the Canadian part of the region these defects are not likely to be important, but further south they are more so; it may therefore be said that wheat may be grown throughout the whole of North Dakota and South Dakota and across Montana to the Rocky Mountains, except where this additional water-supply is not available, or the soils are exceptionally unsuitable.

Another semi-arid region in North America is the central part of the Great Basin. Here the rainfall is distributed rather evenly throughout the year; the amount varies considerably according to the relief, but it may be said that wheat cultivation is possible wherever the mean annual rainfall reaches about 10 inches; here again, however, the possession of a small supply of water for irrigation in certain seasons may be the determining factor.

From the above considerations it is evident that an enormous extension of the area under wheat will take place in North America; but owing to the unsuitable nature of certain soils and the growing of other crops or use for pastoral purposes, not all the possible area will be so utilized. Consequently it is not possible to give an estimate of the ultimate total production of North America; but it may well be double that of the present as far as physical conditions are concerned, that is nearly 2000 million bushels.

JURITZ, C. F. **The Composition of Cape Barley.** — *The Agricultural Journal of the Union of South Africa,* Vol. III, No. 4. Pretoria, April 1912. **1168**

Union of S. Africa: Cape Colony

Early in 1909, when the "Cape Wine, Beer and Vinegar Act, 1908," was brought into operation, brewers represented to the late Cape Government that the provisions of the Act directed against the use of sugar in beer would result in their being obliged to import barley for brewing purposes instead of employing Cape-grown barley (which was mostly of second grade quality) as had been the practice previously. The reason given for this change of practice was that sugar is used in brewing chiefly with the object of reducing the percentage of nitrogenous or albuminous matter which is extracted from the malt in the process of mashing. The inferior grade of barley grown at the Cape was said to contain a type of nitrogenous matter detrimental to the brewing of sound beers; its influence could only be neutralized by the use of sugar as an adjunct to reduce the percentage to a point at which it is all or nearly all assimilated by the yeast during fermentation.

The matter was investigated by the writer and the following conclusions were reached:

The 68 samples of barley whose analyses are recorded, show that as a rule the percentage of nitrogen in Cape six-rowed barleys is not only quite sufficiently low to permit of their being fully entitled to consideration for brewing purposes, but this percentage is distinctly lower than that of the two-rowed barleys, either of English growth or of English parentage, which have been analysed in the Capetown Laboratory.

The proportion of nitrogen in Cape-grown relatively to imported barley seems to be paralleled in wheat and oats. Of the 43 samples of wheat examined in 1909 at the Capetown Laboratory, 37 were Colonial-grown and 6 were imported seed. In the Cape-grown wheat the average percentage of nitrogen was found to be 1.65, and in the imported wheat 2.35. During 1908 fifty-two samples of Cape-grown oats had been similarly analysed, and in these the average nitrogen content proved to be 1.52 per cent. In other countries the average is 1.65, according to some hundreds of analyses quoted by König; while in Great Britain sixteen analyses given by the same authority give a nitrogen average of 2.09 per cent. It was also noted that in the case of oats, as in barley, the nitrogen content of the cereal as grown in the Cathcart Division is higher than in the more westerly parts of the Province.

The imported seeds of barley contained from 3.20 to 4.14 % of fibre, with an average of 3.71 %; while seven barleys grown in the Cape Province from imported grain ranged from 4.34 to 6.82 per cent, averaging 5.65. In the grain entirely of Cape origin and growth the average was 6.19 % with a minimum of 5.48 and a maximum of 6.95.

These figures indicate that the proportion of fibre is less in English-grown two-rowed barley of the class examined than in barley grown at the Cape.

Comparison of imported two-rowed with Cape six-rowed barley may be of very practical importance, but it is in itself insufficient to elucidate the effect of Cape climate on the cereal. Until we have compared two-rowed barley of English or Californian growth, the writer says, with the same variety in South Africa, and have done similarly with regard to six-rowed barley, the whole subject will not have been looked at from all points of view. Six-rowed barley in general contains more nitrogen than the two-rowed variety; this was shown some years ago by Clerc and Wahl of the Bureau of Chemistry of the United States Department of Agriculture, who, after an exhaustive study, pronounced the average percentage of nitrogen in the six-rowed variety to be about 1.92, and in the two-rowed about 1.84. That being so it may be inferred that if Cape six-rowed barley is lower in nitrogen than imported two rowed, much more will it be lower than imported six-rowed.

GUTHRIE, F. B. **Composition and Feeding Value of Maize.** — *Agricultural Gazette of New South Wales*, Vol. XXIII, Part 4, pp. 339-340. Sydney, April 2, 1912. **1164**

Some analyses) have been made by the writer of different varieties of maize. The bulk of the samples (the first 9 in the table of analyses) were from farms on the South Coast of New South Wales, a few others (four) being added for the sake of comparison.

From the appended table of analyses it will be seen that there is a very close similarity in the composition of the different varieties and in their feeding values. Therefore. attempts to increase any particular constituent, such as albuminoid or fat, by cross-breeding, would not be likely to meet with a great success. **Australia N. S. Wa**

The results also show that white and yellow varieties of maize have practically the same feeding value. In the same way there is little or no difference between the bulk maize imported from Argentina and the Northern Rivers bulk maize.

VARIETY	Bone County Special %	Bone County Special %	Early Leaming Hybrid %	Early Leaming %	Golden King %	Golden King %	Yellow Dent Hybrid %	Red Hogan %	Yellow Hogan %	White Maize (from Tenterfield) %	Yellow Maize (from Tenterfield) %	Argentine Maize %	Bulk sample of Northern Rivers Maize %
Moisture	15.28	15.16	17.42	13.55	18.68	20.29	17.02	13.11	16.27	12.72	12.75	12.07	11.36
Albuminoids	9.94	7.63	8.25	9.19	8.75	7.56	7.63	7.81	8.38	10.99	11.37	10.13	10.06
Ether extract	4.13	4.41	4.48	4.55	3.19	3.40	3.03	4.69	4.44	3.51	4.60	4.47	4.57
Fibre	1.24	1.43	1.47	1.42	1.13	1.02	1.47	1.30	1.34	1.61	1.48	1.54	1.53
Ash	1.44	1.45	1.18	1.15	3.34	1.24	1.31	1.36	1.35	1.39	1.27	1.35	1.32
Carbohydrates	67.97	69.92	67.20	70.14	66.91	66.49	69.54	71.73	68.22	69.78	68.53	70.44	71.16
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Nutritive value	87.2	87.5	85.5	89.6	82.8	81.7	84.0	89.7	86.6	89.5	91.4	91.6	91.5
Calculated to dry Substance.													
Albuminoids	11.73	8.99	9.99	10.63	10.76	9.48	9.20	8.99	10.01	12.59	13.03	11.52	11.35
Ether extract	4.88	5.20	5.43	5.27	3.92	4.27	3.65	5.40	5.30	4.02	5.27	5.09	5.15
Fibre	1.46	1.69	1.78	1.64	1.39	1.28	1.77	1.50	1.60	1.85	1.70	1.75	1.73
Ash	1.70	1.71	1.43	1.33	1.65	1.56	1.58	1.56	1.61	1.59	1.46	1.54	1.49
Carbohydrates	80.23	82.41	81.37	81.13	82.28	83.41	83.80	82.55	81.48	79.95	78.54	80.10	80.28
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Nutritive value	102.9	103.1	103.6	103.6	101.9	102.5	101.2	103.7	103.4	101.6	103.4	103.1	103.2
Albuminoid ratio	1:7.8	1:10.5	1:9.4	1:8.7	1:8.5	1:9.8	1:10.0	1:10.5	1:9.3	1:7	1:7	1:8	1:8

ROOT CROPS.

1165 HENRY, YVES and AMMANN, PAUL. **African Manioc.** (Le Manioc Africain). — *L'Agriculture pratique des pays chauds,* 12e Année, No. 110, pp. 353-368. Paris, mai 1912.

Manioc is especially cultivated in the coast colonies of Benin, Nigeria and Dahomey; on the Gold Coast, although it is widely grown, it ranks second to yams and taro.

In Nigeria it is much cultivated in the parts which are covered by semi-dense forests, notably Egbas and Zebus, where the large centres consume enormous quantities.

West Africa

On all the west coast, manioc and yams have been used exclusively for local consumption, as hitherto commerce has not concerned itself with their exportation. The general tendency of the forest population to their cultivation would now permit of a large quantity of the raw substance being obtained for trade purposes; the railways, which have been carried across the great belt of equatorial forests, will aid in developing the production of these roots, which grow by preference in forest soil.

Manioc, although it will grow in poor soils, is a very exhausting crop and prefers rich soils; it is in these, further, that it yields the best crop. This is well known to the natives, who never take more than two crops off the same ground. For the production of manioc the soils devoted to maize culture are used.

Manioc is seldom planted alone; it is usually found mixed with maize, beans, peanuts, yams or potatoes, that is with all the crops of the country.

The usual rotation is as follows: The ground, which has been prepared during the dry season, is sown at the beginning of the rains (April or May) with maize; the latter, after 4 or 5 months, is harvested during the short dry season (July-August). As soon as the September rains begin, a second sowing of maize is made without any soil preparation; but the second harvest is poor, owing to the scanty rainfall at this season. The manioc cuttings are planted in April or May and after the first crop is gathered, manioc is again planted. Finally, when the ground is nearly exhausted, pea-nuts are grown.

In districts where manioc is regarded as a secondary crop, there is always some in the fields, but only on a very small area.

The three principal varieties of manioc grown in Dahomey, on other than forest land, give a product which can be eaten without further treatment; but the roots of two of the same varieties, red and white, which are cultivated on forest soil in Nigeria, contain so much hydrocyanic acid as to give rise to serious accidents.

The black manioc, which according to the natives, yields the best flour, has a dark-coloured stalk, and a root with a black cortex and very numerous swellings (10-15 in good soil), attaining a length of 24 to 28 inches.

White manioc is especially grown for making flour; the stalk is light grey, the roots attain enormous proportions — sometimes 3 ft. 3 in. in length —, the swellings which are never more than 3 or 4 per root are accompanied by 5 or 6 smaller ones.

The red manioc, which is very easily recognized from the red-brown colour of its stalk, has not such large roots as the two preceding varieties. The tubers are numerous and have a reddish brown cortex. The length of the period of growth varies according to the purpose for which the plants are required. The red and black manioc are the earliest. The roots are dug up at the end of 5, 7 or 8 months, if the yare to be eaten cooked, and after two or even three years, if they are destined for flour. White manioc is especially used in this case and it yields the heaviest crops.

According to the Agricultural Service of Dahomey, which has tried to estimate the yield of fields planted for the first time in manioc of the same variety, and where the soil is of the same quality, the crop varies from 16 800 to 32 100 kg. per ha. (134 to 256 cwt. per ac.). Nevertheless, the crops depend on the nature and richness of the soil, and also upon the variety, the care they receive, and the time the manioc has remained in the ground.

After having briefly described the manufacture of the flour, the starch, *gari* and tapioca, the writers state that there is no question of cultivating this plant in Europe, and that, therefore, the export and the methods of preparing tapioca, etc., on the spot are matters of the greatest importance.

In making an approximate estimate, it will be seen that this crop yields as large a gross profit as any other grown for food.

Manioc is usually exported in the form of circles roughly cut out and dried in the sun. The English market readily takes roots cut in lengths of four pieces and dried.

Manioc is used in glucose and alcohol manufacture; it yields usually 42 to 44 % of the material employed. The manufacture of tapioca on the spot would be of great importance as regards its importation into France. Very pure water is necessary for making this product, but from the results of analyses the water Dahomey and the Ivory Coast presents no difficulties in this respect.

FIBRE CROPS.

SCHERFFIUS, W. H. **Cotton Cultivation in the Union of South Africa; Cost of Production and Net Profits.** — *The Agricultural Journal of the Union of South Africa*, Vol. III, No. 5. Pretoria, May 1911. 1166

Union of South Africa

The writer devotes this article to the cultivation of cotton in South Africa and to the work done by the Experiment Stations at Tzaneen, Rustenburg, Barberton and Piet Retief.

We will give here some figures concerning the cost of producing one acre:

	£.	s.	d.
Preparing and breaking (old lands)	—	10	0
Harrowing	—	2	0
Planting	—	1	0
Cultivating	—	5	9
Harrowing and hand hoeing . . .	—	7	0
Picking 1000 lb.	—	15	0
Cartage to gin	—	1	0
Wear and tear on implements .	—	1	0
Sundries	—	3	0
	£2	5	0

One acre of good cotton should produce 1000 lb. of seed cotton, giving 30 % of lint:

	£.	s.	d.
300 lb. at 5 3/4*d* per lb . . .	7	3	9
Total cost of production . . .	2	5	0
Profit per acre . . .	£4	18	9

The last two or three crops marketed have realized on an average more than 5 3/4 *d.* per lb. American uplands have at times fetched on the European market about 7*d* per lb. Reports on South African cotton usually place it 1*d* per lb. higher than American uplands.

But, placing the cotton at 7*d* per lb., the price received last year, with the above calculation we have:

	£.	s.	d.
300 lb. lint at 7*d* per lb. . . .	8	15	0
Cost of production.	2	5	0
Showing a profit per acre of	£6	10	0

Considering that some fertilizer plots last season gave a yield of 1718 lb. seed cotton per acre, with 32.3 % of lint, the estimate of profits could be made as follows:

	£.	s.	d.
554 lb. lint at 5 $^3/_4$*d* per lb . . .	13	6	5
Cost of production	2	10	0
Profit per acre . . .	£10	16	5

The cost of production has been increased 5*s* to cover the increased cost of picking.

1167 PERROT. **The Utilisation of Luc-Binh as a Fibre Plant.** (L'utilisation du Luc-Binh comme plante textile). — *Bulletin de l'Office Colonial*, 5^e Année, No. 53, pp. 164-166, Melun, mai 1912.

" Luc-Binh " or " Trakiet " (*Eichhornia crassipes*) is an aquatic plant which is a perfect pest (1), because while it was still unknown in 1906 in Cambodia, in five years it has become a serious obstacle to the navigation of the rivers of the country.

Cambodia The author's experiments have enabled him to utilise it for basket work, and, what is more important still, for the manufacture of a strong supple sack cloth, equal in resistance to jute canvas. It might thus replace jute in the manufacture of paddy sacks, the consumption of which is so considerable in Indo-China.

Separating the fibre and drying it are very simple operations that can be done by any native. One hundred pounds of Luc-Binh stalks yield about four pounds of fibre fit for use. The breaking weight of a Luc-Binh rope $^1/_5$ of an inch in diameter and 3 feet 3 in. long is 108 lb. and its elongation is 3.93 inches.

According to the author the cost price of this fibre is about 9.67 *d* per cwt. and it might be pressed in bales like cotton and sent to France, where rope factories would offer a sufficient market for the fibre that the Cambodian villages could produce.

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(1) On the use of *Eichhornia* as manure see *B.* May 1911, No. 1390. (*Ed.*).

SUGAR CROPS.

1168 VASILIEFF, E. **The Value of Bees to Seed-Beet Growing.** (Bericht über die Fortschritte im Rüben-und Rübensamenbau Russlands). — *Blätter für Zuckerrübenbau,* XIX. Jahrgang, Nr. 10, p. 155. Berlin, 31. Mai 1912.

Russia

In the Annual Report for 1911 of the Entomological Station of the Government of Kiev, M. E. Vasilieff describes the important part played by bees in seed-beet growing.

It has been observed that the bees, by assisting in pollination, increase the seed formation. Each insect carries 0.05 gr. of pollen, the load being exactly divided between its two legs. The bees never go further then about 2 miles from their hive (1). If it is wished to prevent the cross-pollination of the seed beets by means of bees, it is necessary to plant the different kinds at a distance of at least a mile and a quarter apart and not, as has been done hitherto, only two to five hundred yards from one another.

On the other hand bees protect not only fruit tree blossoms but also the flowers of the beet from the injury and interference due to the attacks of harmful beetles, especially those of the family *Scarabaeidae* and the sub-family *Cetoniinae.* In order to fully utilize the twofold activities of the bees in the cultivation of beet-seed, it is well to keep some permanent or movable hives in the neighbourhood of the fields of seed-beets during the flowering time of these plants.

OIL CROPS.

1169 NOURY, C. **The Okpê-aoumon Oil Palm of Dahomey.** (Note sur une forme de Palmier à huile du Dahomey). — *Journal d'Agriculture Tropicale,* No. 131, pp. 137-139. Paris, 31 mai 1912.

Dahomey

There are in Dahomey several varieties of oil palms; the natives call " Okpê-aoumon " the variety characterised by the thin shell of its fruit, green, dense pericarp and greater oil content than the common fruit.

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(1) The rapidity of the bee's flight is estimated at 30 miles an hour or 47.5 ft. per second. Bees often fly long distances from their hive; if the supply of honey is scanty, they have been seen as far as 6 miles from their home. They generally, however, collect honey within a radius of about 2 miles from the hive. (Cf. R. HOMMEL: *Apiculture,* p. 46. Paris: Baillière, 1906). (*Ed.*).

According to the author 100 lb. of bunches of Okpê-aoumon yield practically 55 to 60 lb. of fruits, and 100 lb. of these contain 15 lb. of oil and 12 lb. of kernels.

The author observes that the common palm yields 10 lb. of oil and 14 lb. of kernels per 100 lb. of fruits. Calculating the value of the oil at £22, 2s. per ton and the kernels at £12, 1s., it appears that the fruits of Okpê-aoumon fetch about 16s. more per ton.

Should this superiority be confirmed in practice the author advises the multiplication of this variety in the palm groves on the coast of Africa, after having ascertained if this multiplication, which cannot be carried out by means of seeds in the groves where the common palm is predominant, would not give the best results in groves composed exclusively of Okpê-aoumon. He therefore recommends the creation of small experimental plantations, which are well worth trying, considering that $^{9}/_{10}$ of the exports from Dahomey are supplied by the palm groves.

RUBBER, GUM AND RESIN PLANTS.

1170 **Industrial Value of three Rubbers from French West Africa.** (Valeur industrielle de trois caoutchoucs de l'Afrique Occidentale Française). — *Bull. de l'Office Colonial,* 5e Année, No. 53, pp. 145-146. Melun, mai 1912.

French West Africa

The Rubber department of the Colonial Office has determined the industrial value of three samples of rubber from French West Africa:

The following are the characters of the samples:

1. Smooth brown crêpes from *Hevea brasiliensis;* 1909 crop; coagulated by acetic acid; from Porto Nuovo.
2. *Landolphia Hendelatii* scrap 1910 crop; coagulated spontaneously on the liana; from Kankan.
3. *Ceara* scrap; 1909 crop, coagulated by lemons; from Sedhiou.

The tests were made on the samples treated mechanically, then dried and vulcanized with 3.5 and 10 % of sulphur during three hours at 140° C. An investigation as to their extensibility and elasticity made with Chéneveau and Heim's registering elasticimeter has allowed the characteristic coefficients of these rubbers to be determined, and by comparing these with the coefficients of the Para Standard (Fine Para Hard Cure) they have been graded as follows:

	Porto Novo Hevea	Kankan Landolphia	Sedhiou Ceara
Suppleness.	1.8	2.4	1.3
Structure (nervosité)	0.65	0.2	0.8
Tenacity	0.9	0.9	1.0
Extensibility	1.6	3.2	1.0
Elasticity.	0.8	0.6	0.6

From the above it appears that the suppleness of Porto Novo Hevea rubber compared with that of Para is as 1.8 to 1, while the respective extensibilities are as 1.6 to 1. Its structure is $^{65}/_{100}$ of that of Para, its tenacity $^{9}/_{10}$ and its elasticity $^{8}/_{10}$. Its structure is even inferior to the Indo-China Hevea rubbers of the Belland plantation and of the Ong-Yen garden which had been previously examined by the service.

The rubber produced by *Landolphia Hendelotii* is especially supple and extensible, but of inferior structure and elasticity; its residual elasticity is, on the contrary, rather high (0.12, that of Para being nil).

They are good average rubbers.

The Ceara rubber which has been examined, resembles tender wild Para, though somewhat superior as to structure, but much less elastic.

BALDRATI, I. **Manihot Glaziovii in Eritrea.** — *L'agricoltura coloniale*, Anno VI, No. 5, pp. 209-212. Firenze, maggio 1912. **1171**

The Author observes that in the special literature of the subject a difference of views exists as to the value of this rubber plant. Its cultivation is said to be advisable in countries well favoured in point of rain, while there are others who state that it is only admissible for countries having a long period of drought which are closed to other species. The uncertainty and the diversity of views relate to the selection of species, the method of cultivation, and still more the condition of gathering the rubber. **Eritrea**

The Author himself has not yet arrived at a very clear opinion on this group of problems and confines himself for the moment to putting forward a few results obtained by him in Eritrea. The conclusions to be drawn from the study of a lot of manihots (14 plants) grown at Filfil from seeds originating from French West Africa, suggest the hope that this cultivation may produce good economic results in this region.

The growth of the plants was rapid; of the 14, 12 have a diameter between 6 and 8 inches.

The method of tapping yielding the best results is by oblique incisions of a length of 2 to 4 inches, arranged in parallel helicoidal sets running from the butt up to a height of 6 ft. 6 in., and separated from each other by distances varying from 3 ¼ to 4 inches.

The collecting was carried out without difficulty at the foot of the tree on beaten compressed soil.

The tapping should always be preceded by the removal of the bark. Without any attention in the form of weeding, irrigation and manuring, the average yield is found to be 40 grams (nearly 1½ oz.) obtained by a single tapping.

VARIOUS CROPS.

1172 BAILLAUD, E. **Drying Tobacco by the Flue Curing-Process.** (Le séchage du Tabac par le Flue Curing-Process). — *Journal d'Agriculture Tropicale,* No. 131, pp. 129-133. Paris, 31 mai 1912.

Union of South Africa: Transvaal

In the Flue Curing-Process the open fires are replaced by flues conveying hot air.

This American system has been succcssfully adopted by Mr. H. W. Taylor, who has installed at the Rustenburg station in the Transvaal a model curing-house based on this principle and which proves particularly useful in the preparation of the light yellow leaved tobacco. The yellowing of the leaves is an improved method which should only be applied where it can be carried out in its entirety with all the care necessary to ensure the production of a tobacco that will fetch the high prices in view of which the method has been devised. Thus for its complete success all the special instructions, of which the chief deal with the choice of the variety of tobacco, topping, and the gathering of the leaves, must be followed.

The varieties which in the Transvaal have given the best yellow leaves by the flue curing-process are: Yellow Pryor, Bullion, Hester, Blue Pryor, and Boyd 1269. The tobacco intended to be flue-cured must be cut low, leaving only 12 to 16 leaves having about the same degree of maturity. The harvest is carried out in three times, beginning with the lowest leaves which are the first to ripen. They must be separated from the stem in the field and conveyed to the curing house in large flat baskets.

The curing house must be small, and divided into four chambers able to contain 480 laths bearing the tobacco of 3 360 plants. Each curing house may be refilled three times per month, so that 10 080 plants may be cured in the course of a month. Each chamber in its turn is subdivided into five floors, of which the lowest is the loftiest to prevent the tobacco in it being injured by too high temperatures. A flue in which hot air circulates runs all round inside the house at about 2 feet from the walls and issues at a level about 3ft. higher than its starting-point at the fire-place situated about 2 feet above the hearth.

In flue-curing there are four stages through which the tobacco passes: the yellowing, fixing the colour, drying the leaf and drying the central rib and stalk. A moderate fire is kept up at first, and gradually increased up to about 89.6° F.; after 10 hours the temperature is raised to 100.4° F., when the tobacco begins to turn yellow; the temperature is still further raised to 119.3° F. and kept up till the leaf is completely yellow. The colour is then fixed by heating gradually up to 131° F. and then sinking to 125.6° F., at which temperature the tobacco is kept until the leaf is practically dry. In order to cure completely the leaf and the central rib the temperature is raised in two hours to 131° F. and kept at this for six hours; by successive stages of six hours each the temperature is raised to 135.5° F., to 143.6° F. and at last to 159.8° F. at which it is kept during 8 or 10 hours until the stalk is completely dry. Mr. H. W. Taylor recommends that the fire be extinguished as soon as the operation is ended and the curing house allowed to cool down; after which the ventilators are to be closed and the floor and the walls under the tobacco watered. This moisture is to be kept up for one day, then a small fire is lit in the fire place and some wet sacks are placed on the flues so as to produce the steam necessary to soften the leaves sufficiently to allow of their removal. When the central rib is soft enough to be bent without breaking, the leaves are removed, sorted and made up into parcels of twelve to fifteen leaves each.

NEWPORT, HOWARD. **Coffee Culture in North Queensland as it was and is.** — *Queensland Agricultural Journal*, Vol. XXVIII, Part. 4, pp. 264-268. Brisbane, April 1912. **1178**

Australia: Queensland

In North Queensland, fifteen to twenty years ago, there was what may be called a boom in coffee; but as the plantations were not always made in suitable places, or rightly cultivated, and owing on the one hand to an insufficient supply of labour and an erroneous computation of the amount of the product required for local consumption, and on the other to the low price of Brazilian coffee, which rendered competition difficult, a period of depression soon succeeded this time of prosperity. The greater number of the plantations were therefore abandoned and only a few of them survived.

Now, however, the coffee market is becoming consolidated, and while parchment coffee in Queensland reached its minimum at about 4½*d* per lb., its present price is 7½*d* to 8*d* per lb. Also some plantations which failed at first have since proved successful.

Owing to experience, the methods of transport have been made easier, and further the population has increased.

The critical period of coffee culture in Queensland can thus be said to be over, and the few plantations which have survived it are very paying. Such plantations are those at Mt. Buderim, Mackay (Mount Jukes), Atherton, Kuranda, and many of them give returns of from 8 to 10 cwt. per acre as an average, and up to 20 cwt. in specially good seasons.

According to the agricultural statistics occurring in the last annual report (1911), of the Department of Agriculture and Stock of Queensland, the average returns for the two districts of Mackay and Herberton were 2 304 lbs. and 1 046 lbs. respectively per acre.

Most of the growers manufacture their own coffee and find a ready local sale for it, and that within a radius of a few miles only.

The writer considers that the large plantations commonly existing in (usually black labour) countries where coffee is grown, are not adapted to Queensland, and the plantations must be limited in area practically to what one settler can manage, say to 15 acres.

The cost of opening may be put down at:

Land (outright purchase)	£ 5	per acre
Felling	£ 2	»
Clearing	£ 2	»
Plants	£ 1	»
Planting	£ 2	»
Total	£12	per acre

The cost for 15 acres is £180, and that of buildings and machinery necessary for a plantation of this size £250.

Add to the capital, the cost of upkeep, until is bearing, one man's wages at 8*s* a day for three years, £375, involving a total investment of a capital of £805.

This is an outside estimate, in that new scrub land is allowed for; should already cleared and stumped banana land be selected and taken on long terms, it would probably cost less, as the cost of felling and clearing would be saved, and if catch crops, such as bananas or vegetables, were grown between the coffee plants during the initial period of waiting, the cost of planting would be considerably decreased. In the matter of returns, the first, and possibly, second crops would but cover expenses.

Once in full bearing and properly opened, an average crop of 10 cwt. per acre may be safely anticipated. The successful production depends very largely on the cost of harvesting; 1*d* per lb. is a fair price for the picking of coffee berries, as this amounts to more than ½ and nearly ²/₃ of its value. Ripe coffee berries produce ¼ or ¹/₅ of their weight in dry marketable produce called « parchment ».

A return of 10 cwt. (parchment) per acre would involve a cost of harvesting for the whole plantation of not more than £350, and to this must be added the cost of annual upkeep of £125 making a total of £475.

The 7½ tons at say, 7½*d* per lb. would be worth £525, to which must be added the Federal Government bonus of 1*d* per lb. of clean coffee, equal to £7 per ton in parchment, amounting to £52 15*s*, making a total gross annual return of £577 15*s*, and net returns of £102 5*s*.

This represents a rate of interest on the greatest amount of capital invested of some 12 %.

The writer advises the cultivation of coffee to new comers to the colony with small capital, especially if they have families, who could do all, or most, of the harvesting which lasts four months.

BALDACCI, A. **The Cultivation of Sparto in Tripoli.** (Una grande coltura della Tripolitania). — *Boll. Società degli Agricoltori italiani*, Anno XVII, No 11, pp. 331-335. Roma, 15 giugno 1912. **1174**

Tripoli

Alfa, or sparto, *Stipa tenacissima* (1), is very abundant in the whole of the interior of Tripoli; it occupies great areas in the sterile localities, preferring ferruginous sands well exposed to the sun and within the influence of the sea. The leaves, which yield 56 % of fibre and are used for the manufacture of paper, are gathered during the dry months, because at other seasons they are so firmly attached to the stems that in stripping them it is easy to uproot the whole plant. The leaves are gathered by hand and a man can collect a great number of them in one day.

The exportation of alfa from Tripoli began some years before 1870. At first only the coast belt was worked, but with such avidity that alfa has now become a product of the interior. The quantity exported varies between 40 000 and 50 000 tons per annum, most of it going to England, where alfa fetches from 56*s*. to 66*s*. per ton.

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(1) See *B*. June 1911, No. 1745 ; Aug.-Sept.-Oct. 1911, No. 2598. (*Ed.*).

MARKET GARDENING.

1175 **The Truffle in Tunis.** (La Truffle en Tunisie), — *Bull. mens. de l'Office du Gouvernement Tunisien*, VI^e Année, No. 54, p. 107. Paris, 15 mai 1912.

No attempts have hitherto been made to grow truffles in Tunis; but in the opinion of the technical service of the Tunisian Government, the experiment would be worth trying, seeing that the local conditions place no apparent difficulties in the way of its success.

Tunis

The indigenous truffles are not articles of export; there are three species recognized by the natives.

1. *Terfess iober.* This is black, smaller than a hens' egg, white inside. It grows at the foot of *Cistus sessiliflorus* in red sandy clay 1 to 1 ½ inches below the surface. Somewhat scented; eaten raw or cooked.

2. *Terfess ahmar.* Red like the potato Early Rose; it also grows at the foot of *Cistus sessiliflorus* and in the same soil as the preceding species; it differs from that in its richer colour and its larger size. It is eaten cooked and replaces the potato in the diet of the Arab population.

3. *Terfess abiod,* also called *belourich*; this is white and about the size of a man's fist. Grows in soil containing gypsum. Loses its flavour on cooking.

The two first species grow in the north of the country, the third has as its zone of distribution the centre and south. These truffles are altered easily by moulds, as the mycelia of the latter live upon their starchy matters; their preservation necessitates desiccation, which is effected by the natives by the easy method of exposing them to the sun.

1176 BILLAUDELLE, L. **The most Drought-Resistant Border Plants.** (Les Plantes de bordure qui résistent le mieux à la sécheresse). — *Revue horticole*, 84^e Année, No. 12, pp. 288-289. Paris, 16 juin 1912.

Investigations on dry, sandy and stony soils (especially those which had been little watered) during the summer drought of 1911, showed that the results of the want of moisture were most noticeable the following spring in the absence, or poor condition, of

France

the foliage of those plants which were not drought-resistant, these being either destroyed or decimated.

Amongst resistant plants the writer mentions: *Teucrium Chamaedrys* L., *Satureia montana* L., *Stachys lanata* Jacq., *Santolina Chamaecyparissus* L., Box., *Euonymus pulchellus*, *Berberis buxifolia* Lamk., *Arabis alpina* L., *Alyssum saxatile* L., *Iberis Garrexiana* All., *Iberis sempervirens* L., *Aubrietia deltoidea* D. C. and A. *purpurea* Hort., *Sedum spectabile* Bor., *S. atropurpureum* Hort., *S. Spurium* Biele, etc., *Festuca glauca*, *Dianthus plumarius* L., *Plumbago Larpentae* Lindl.

Plants with bulbs or rhizomes, such as Snowdrop, Winter Aconite, Ornithogalum, Grape Hyacinth, Narcissus and Hyacinth also showed themselves drought resistant; but these are seldom used for borders.

With regard to *Santolina*, the writer remarks that it remained green throughout the year without watering on a slope more than 20 inches above the road. But dryness is favourable to the development of this plant, which in damp seasons and on humid soils is often greatly injured by a mildew, which attacks its stems and roots.

PODESTÀ, DARIO. **Investigations on the Cultivation of Flowers at Villanova d'Albenga and on the Returns from Violet-growing.** (Ricerche sulla coltivazione dei fiori nel territorio di Villanova d'Albenga e sul rendimento della viola mammola). — *L'Agricoltura italiana*. Pisa, 16 giugno 1912. **1177**

Italy: Liguria

The territory of Villanova d'Albenga in Liguria is situated at a distance of about 3 ³/₄ miles from the sea and enjoys a mild climate (in winter the minimum temperature rarely falls below 4° C.). The rainfall is, according to the author, about 40 inches. Instead of maize, beans, wheat and potatoes which were formerly the chief crops grown there, the cultivation of flowers has gradually spread, especially that of violets and narcissi for which the climate is particularly favourable.

Before the introduction of flower-growing the usual rent for land was about £2 17*s*. to £3 8*s*. 6*d*. per acre; now it has risen to £4 11*s*. 4*d*. to £6 17*s*. per acre and the value of the land has risen from £68 10*s*. to £114 per acre. The wages of farm labourers have also increased from 1*s*. 2 ¹/₄*d*. to 1*s* 11 ³/₄*d* per day, besides food.

The flower-growing of this region is a typical example of small farming; in fact independently of the very limited areas on which it is carried out this cultivation is done entirely without the assistance of draught animals, and exclusively by intensive and intelligent human labour. Nor is this all, for as it is one of the most intensive of cultures it enables a family of 10 members to live on an area of barely 5 acres. Generally violets alternate with narcissi, a crop of maize or beans or other quick-growing vegetable being introduced between.

For the sale of their produce the flower growers who have freed themselves from local middlemen form groups of two or three individuals and export their wares together. The flowers leave Albenga by the fast trains and within about two days they arrive on the markets of Prague, Budapest, Munich and Vienna. The flower trade in the interior is not considerable, and is limited to Turin, Milan, Venice etc., when prices are low abroad.

In the Villanova neighbourhood the single-flowered Victoria violet is the variety most grown, as it is equally adapted for nosegays and for the preparation of perfumery. As the climate is rather cool in autumn and in winter the violets are kept constantly covered ; during the night they are sheltered by straw spread as a horizontal roof on pegs about 15 inches high. The soil is carefully worked to a depth of about 14 inches and manured with stable manure at the rate of about 22 ½ tons per acre ; in February the violet runners are planted in rows at about 16 inches apart. Between February and November they are hoed 8 times and weeded 2 or 3 times. They are watered or irrigated more or less frequently according to the weather.

The first year they are manured again with oil-cake and sometimes with superphosphates, once in May and once in August. In the succeeding years the same operations are repeated, with the difference that in August the plants are mowed and a top dressing of about 8 ½ tons of stable manure is given and lightly dug in ; after some days oil-cake is given.

The first year the harvest begins on October 20 and it lasts till the second half of March. The profits in this year are greater than in the following years, because, though the yield is smaller, it is earlier and coincides with the time in which prices are high. Usually the plantations last 4 to 6 years.

The author gives the following table of the expenses and returns of violet-growing:

Cultivation of Violets.

Average data per acre.

Expenses.

1st Year.

	£	*s*	*d*
Working the soil: 28 3/4 man-days at 2*s* 9.3*d*	3	19	10 3/4
Farmyard manure: 22 1/2 tons at about 12*s* per ton.	13	13	11 1/4
Preparing the soil and planting: 28 3/4 days, men and women at 1*s* 7*d* per day	2	5	7 3/4
Runners	2	17	0 3/4
Weeding, hoeing, watering: 115 days, women's labour at 1*s* 2 1/4*d*	6	16	10 1/4
Top dressing: 11.3 cwt. of oil cake at about 8*s* per cwt.	4	11	3 1/2
Working in the manure: 14 1/2 days, men's labour at 2*s* 9.3*d*	1	19	11 1/2
Further weeding and hoeing: 28 3/4 days, women's labour at 1*s*. 2 1/4*d*.	1	17	2 3/4
Harvesting:			
7.62*d* per 100 bunches (66 170 bunches)	21	0	0 1/2
Rent of land.	5	14	1 3/4
Cost of water for irrigation	—	1	10
Interest on outlay and sundries.	2	17	0 3/4
Total	£67	12	2 1/2

2nd and following Years.

	£	*s*	*d*
Weeding: 14 1/2 days women's work	—	17	1 1/2
Mowing: 28 3/4 days women's work	1	14	3
Stable manure: 11 1/4 tons; carriage, spreading and working in of manure, 23 days men's work	3	3	11
Top-dressing: oil-cake 11 cwt.	4	11	3 3/4
Spreading and covering oil cake: 17 1/4 days women's work.	1	0	6 1/2
Hoeing and weeding in autumn: 28 3/4 days women's work	1	14	3
Harvest: 7.6*d* per 100 bunches (71 925 bunches)	22	16	6 3/4
Cost of water for irrigation	—	1	10
Rent of land.	5	14	1 3/4
Interest on outlay and sundries	2	17	0 3/4
Total	£51	7	11 1/2

Returns.

1st Year.			
66 171 bunches at 3*s* 6 3/4*d* per hundred	118	2	8 3/4
2nd Year.			
71 925 bunches at 2*s* 9 ½*d* per hundred	99	17	5 3/4
3nd Year.			
71 925 bunches at 2*s* 9.3*d* per hundred	99	17	5 3/4
4th Year.			
57 540 bunches at 2*s* 9.3*d* per hundred	79	17	11 3/4
5th Year.			
43 155 bunches at 2*s* 9.3*d* per hundred	58	18	5 3/4
Increase of soil fertility . . .	2	17	0 3/4

The final accumulation of net returns is £207 1*s* 11½*d*; consequently the average net returns per acre per annum are £38 4*s*. 9*d*.

FRUIT - GROWING.

1178 CHAPPAZ, GEORGES **The End of the Phylloxera Crisis in France.** (La fin de la crise phylloxérique en France). — *Le Progrès Agricole et Viticole*, 29 Année, No. 26, pp. 801-806. Montpellier, 30 juin 1912.

France

Since the phylloxera began its ravages in France, 45 years ago, considerable changes have taken place in the conditions of the vine-growing districts. There are, even to-day, ungrafted vines covering considerable areas, and grafted vines already old can also be found.

In Champagne, where the disease was combated most energetically, there are nearly 5000 acres of very young grafted vines amongst the 32 000 acres which constitute the vineyards of this district. The disease made its first appearance in Champagne 22 years ago. In 1897 there were only 35 acres infected. The hot dry season of 1900 quickly increased the extent of the phylloxera area to 3 200 acres; in 1902 the annual inspection revealed about 5000 acres; 1904 was again a favourable season, and in 1906 there were about 10 000 acres affected by the disease. At the present time, about 20 000 acres have become a prey to the pest; the resisting individuals have finally succumbed, owing to the ravages of mildew and *Conchylis*, which hastened the catastrophe; the dry summer of 1911 furnished its quota by favouring the development of parasitic insects.

This brings us to the second phase of the phylloxera crisis in France. Grafting is now being carried out on the last hills bearing ungrafted vines, and within a decade the work of reconstruction throughout France will be brought to a conclusion.

The disease has been combated by the use of bisulphide; this remedy has retarded for more than 20 years the complete destruction of the ungrafted vines, and will allow of those plots which are resistant bearing fruit during the reconstitution of other vineyards. The Defence Syndicates have now become syndicates for grafting, and upon these Societies devolves the rapid reconstitution work directed to the preservation of the fine qualities of these valuable wines.

The districts which are at present being ravaged, have to solve the serious problems involved in preserving intact the quality of their products; but they are able to profit by experiments made on adaptation throughout France.

One of the most important questions is, whether reconstitution and grafting will not affect the quality of the wines, especially in the districts where choice wines are made. The writer, however, thinks that, though in some districts mistakes made through want of direction have led to loss of quality in the wine, there are many grafted vines which yield to day a wine as good as, if not better than, that obtained in the past.

Experiments made by a Champagne wine-producer, M. Albert Legée, prove that grafted and ungrafted Pinots of the same vineyard and of the same age have furnished wines between which connoisseurs could detect no difference. Thus, we may await with confidence old wines from grafted vines, large crops, and extensive vineyards.

MOREAU-BÉRILLON. **The Vineyards of Champagne.** (Le Vignoble de la Champagne). — *La Vie Agricole et Rurale,* No. 29, pp. 64-68. Paris, 15 juin 1912. **1179**

France

The district which produces champagne is somewhat restricted, only some thirty or thirty-two thousand acres of vineyards in the Department of Marne being capable of yielding true champagne. The large vineyards of Champagne are included in the "arrondissements" of Reims and Epernay, to which may be added the canton of Vertus, which belongs to the "arrondissement" of Châlons.

The following regions are there distinguished:

1) The "Montagne de Reims," with the vineyards of Trépail, Villers-Marmery, Verzy, Verzenay, Mailly, Ludes, Chigny, Rilly. It is continued towards the north by the "Basse-Montagne" (Villedommange), then, north of the Vesle, by the "petite Montagne de Reims,' or "Montagne de Saint-Thierry," with the vineyards of Saint-Thierry, Hermonville, and Marzilly. It is connected with the "rivière de Marne" by the vineyards of Bouzy and Ambonnay.

2) The " rivière de Marne ", including on the right bank of the river the remarkable vineyards of Ay, Mareuil, Avenay, Mutigny, Dizy, Champillon, Hautvilliers and Cumières and extending as far as Château-Thierry; and on the left bank are the vineyards of the slopes of Epernay: Epernay, Pierry, Moussy, Monthelon, Saint-Martin-d'Ablois, Vincey, Chouilly, etc.

3) The " Montagne d'Avize, " which includes: the hills of Avize and of Vertus with the vineyards of Cramont, Avize, Oger, Le Mesnil, Vertus, Cuis, Grauves, etc.

From these groups, secondary branches detach themselves: the vineyards of the Ardre valley and of the Tardenois, of Cernay and Nogent l'Abbesse, of Ferebrianges, of Sézanne and of Vitry-le-François.

Climate. — The vineyards of Champagne are situated on the northern limit of vine-culture, under a climate of the Paris basin type. The mean annual temperature is 10.7° C. (51.3° F.), mean winter temperature 3.3° C. (38° F.) and mean summer temperature 18.1° C. (64.6° F.).

The rainfall is scanty on the chalky plain of Champagne, but more copious on the Tertiary plateaus which form its western boundary.

The most valuable vineyards are situated on the foothills which join the plateaus of Brie and the plain of Champagne, between 150 and 170 m. (500 and 550 ft.); those at a lower level are much exposed to frosts and yield inferior grapes. The large vineyards have usually a southern exposure (Ay, Mareuil, Bouzy) or a south-east (Avize, Cramant); some, however, (Mailly, Verzenay) face north-east, but the slope being less than 20°, decreases any bad effects due to the northern exposure, which does not seem inferior to the others.

The prevailing winds are west and south-west; but the plateaus on whose slopes the vineyards are situated are generally covered with forests, which protect the vines from strong winds. These wooded parts have a larger rainfall than the surrounding plain; they retain the water and thus form a reserve of moisture, which the vines planted at a lower level can profit by. The light there is not very intense, so that the grapes ripen slowly and are sometimes deficient in sugar, and special flavour is lost.

Soil. — In ascending the slopes of the hills which border the plain of Champagne on the west, on leaving the Upper Cretaceous or Reims chalk, a series of very variable strata belonging to the Eocene formation are met with. These are the sands of Châlons-sur-Vesle, the Rilly marls and limestones, the plastic clay, which contains lignite in some districts, the nummulitic sands, the lower and upper "calcaire grossier" and the Saint-Ouen limestone; above comes the Oligocene with the millstone-bearing Brie clays. Lastly, on the tops of the plateaus occur loams, and on the flanks of the hills the slope-deposits.

The soil of the vineyards consists of the last-named, formed of weathered fragments from the strata above resting upon chalk, which forms the subsoil of the vineyards, occurring at variable depths rarely less than 12 or 16 inches. The soil is loamy, reddish or grey in colour according to whether it is more or less ferruginous, and full of fragments of chalk and siliceous pebbles. Through the addition of soil, of ashes containing pyrites, and of the sands which occur in abundance in the strata above the vineyards, the natural soil is completely changed; the vine grows in an artificial soil, as the addition of soil and soil-improvers is general in the large vineyards.

The wines. — The vines grown in the large vineyards mostly belong to the Pinots family, which is the chief family of vines for the production of first quality wines. In Champagne, where the average daily temperature is low and spring frosts are to be feared till late in the year, early vines, needing a relatively low temperature for their development, alone have any chance of succeeding and of ripening their grapes. Varieties of black Pinot are specially grown; the names of these vary according to the district: Vert Doré d'Ay, Pinot Noir de Bouzy, Pinot Noir de Verzenay, Pinot Franc de Vertus, Pinot de Fleury, Pinot d'Hervelon, etc. The black Pinots ripen early, do very well where the subsoil is chalky and the soil ferruginous; in these cases, the wines are of exceptional quality, possessing body, vinosity and bouquet. These wines are chiefly grown in the Montagne de Reims and the Rivière de Marne.

On the hills of Avize, where the soil is greyer and more chalky, the Chardonnay or Blanc de Cramant is preferred; according to some experts, this is not the true Pinot Blanc. Later by a week than the Pinot Noir, it yields a wine which is more acid, but lighter and less heating, and more readily becomes sparkling.

In the secondary vineyards, Pinot Meunier is also met with; this is more productive and resistant to frost than the black variety, but the wine made from it is much inferior.

The varieties Gamais Blanc and Gamais Noir, Meslier Doré, Bourguignon, etc., are also grown, but on very limited areas.

1180 LATIÈRE, H. **The Position of Olive-Growing in France.** (La Situation oléicole en France). — *La Revue des Colons de l'Afrique du Nord*, No. 2, pp. 34-35. Paris, 11 avril 1912.

France

M. Latière, General Secretary of the French National Society of Olive-Growers, observes that the position of olive-growing in France tends to improve in consequence of the endeavours made by the Government, seconded by the " Société d'Oléiculture de France ". In 1866 France had 380 000 acres of olives; in 1892 the area was only 330 000 and now there are barely 250 000 acres. Some regions mainly devoted to olive-growing were planted with vines at the time of the restoration of the French vineyards. During forty years in the valley of Baux about 200 000 olive trees were grubbed; in the Crau two-thirds of the trees have been grubbed. In the olive-growing centre of the Department of Var, the clearing of oliveyards was so intense as to give rise to a considerable trade in olive wood for fuel: the commune of Puget-Ville alone exported more than 2 000 tons per year. Fortunately the viticultural crisis has directed the attention of agriculturists to the remaining olives, and to-day there is a great falling-off in their destruction and they are the subject of fresh care.

In 1892 there were still in France about 24 000 000 olive trees. How many remain to-day? This will very soon be known because the census of olive trees is obligatory for the distribution of prizes. In any case the census will not show more than 18 000 000 trees.

If it be taken into account that one half of the existing oliveyards are still abandoned or badly cultivated, the small production of oil in France, not exceeding an annual average of 20 000 tons of olive oil, can afford no ground for surprise. France must for its own consumption import a quantity of oil exceeding that produced in the country. The oil imported comes from abroad and from Tunis and Algeria.

In 1911 the importation was as follows:

from Spain	3 338 tons
» Italy	2 381 »
» Algeria	2 444 »
» Tunis	2 613 »
» other countries	1 899 »

French exports to foreign countries, on the other hand, in 1911 amounted to only 5 000 tons.

In face of this position of affairs, France must carefully cultivate her oliveyards, must keep animal and vegetable parasites under, improve the preparation of the oil, and form co-operative societies of growers. The efforts of agriculturists should be encouraged by the intervention of the Government. The production bounties fixed are insufficient; customs tariffs should be adopted to protect national production by taxing foreign imports. At the same time the present land registers, in which oliveyards are still classified as first-class lands, should be revised. This is the more necessary on account of the keen competition offered to the French product by Algeria, Tunis, Italy, Spain, Greece, Turkey and California, all of them countries making considerable progress in olive-growing and oil production.

The "Société Nationale d'Oléiculture de France" has entered upon the regeneration of olive-growing. It organised the International Congress of Olive-growing and Olive-oil Production at Avignon in 1911 and the olive-pruning competition at La Valette (Toulon). In June 1912 it organised the National Congress of Marseilles.

In addition to the improvement of the cultivation of the olive there is needed an improvement of the system of manufacturing the oil and the transformation of the antiquated means of industrial production.

GONZALES, JOSÉ MARIA. **The Production and Exportation of Oranges in Spain.** *Dirección general de Comercio, Industria y Trabajo. — Boletin oficial de Comercio, Industria y Trabajo.* Año I, No. 1. pp. 25-47. Madrid, Mayo 1912. **1181**

Spain

By the instructions of the Ministry of Commerce, Industry and Labour and the "Secretario del Centro de Comercio Exterior y Expansión Comercial" the Author has inspected the Spanish citrus-growing regions (Castellón, Valencia, Alicante and Murcia) in order to study the damage which the Spanish orange exportation might have sustained in consequence of the recent strike of English miners. It seems that for this class of workmen the orange is an article of necessity, as it is used for allaying the feeling of thirst produced by the exceedingly fine dust which settles on the lips and in the mouth.

The Author satisfied himself that the fears which had been entertained in this matter were unfounded, because the reduced exportation to England had been more than counterbalanced by the larger exports to other countries. Nevertheless in Valencia there was a falling-off in the exports of 50 000 cases per week from the middle of February onwards, *i. e.* 200 000 cases of a value of £87 000 ($425 000) at the time of inspection, the loss being almost exclusively sustained by the small exporters who forward the goods only on receipt of advances and who had been unable to secure such advances from the English importers. The total exports of Spanish oranges, however, not only showed no decline in the first two months of 1912 in comparison with the same period in the two previous years, but on the contrary exhibited a rise, in keeping with the ever increasing area devoted in Spain to orange cultivation and production. The following figures are calculated from the statistics published by the Spanish General Direction of Customs:

	Weight in lbs.		
	January	February	Total
1910 . .	165 751 130	163 128 964	328 769 843
1911 . .	48 280 999	144 994 104	193 275 103
1912 . .	189 246 077	193 251 538	382 497 615

	Value in £ sterling					
	January		February		Total	
	£	s	£	s	£	s
1910 . . .	357 732	11	351 835	7	709 567	18
1911 . . .	104 202	2	312 933	13	417 135	15
1912 . . .	408 440	11	417 085	7	825 525	18

	Value in $		
	January	February	Total
1910 . . .	1 742 287	1 713 566	3 455 853
1911 . . .	507 504	1 524 100	2 031 604
1912 . . .	1 989 253	2 031 357	4 020 610

Passing on from the above question the Author proceeds to examine the general question of Spanish citrus production, the markets open to these fruits and those which could be acquired by ousting the competition of other countries, especially Italy. (1)

The orange occupies the leading place among exports of Spanish agricultural produce, with an annual value of £ 2 750 000 (13 ½ million $). The orange-growing provinces are in particular Castellón and Valencia. A few years ago the former had about 40 000 acres and the latter some 30 000 acres of orange plantations;

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(1) See also: Ministero di Agricoltura Industria e Commercio. Ispettorato generale dell'Industria e del Commercio. Ufficio di informazioni commerciali. *Prodotti agrari spagnuoli, francesi, italiani in concorrenza sui mercati stranieri.* Relazione del Cav. Antonino d'Alia. Roma 1909.

Cf. also *B.* May 1912, No. 805. (*Ed.*).

of late years however very extensive plantations have been made in Castellón (at Villareal over 2 500 acres in seven years), so that to-day the two provinces together possess more than 100 000 acres of oranges, almost equally divided between them. Andalusia has a yearly production of barely 200 000 cases; Murcia has about 2 500 acres of plantations, with a yearly production of about 300 000 cases; Alicante has 3 700 acres. The Spanish citrus-growing region is therefore the east part of the country. From the coasts of this region more than 3 000 steamers put to sea every year . exporting above 30 000 000 packages made up of cases, barrels and baskets of oranges and other fruits. Burriana and Villareal alone export more than 2 000 000 cases of oranges or their equivalent.

There are three descriptions of cases, containing 420, 714 and 1064 oranges respectively. The transport tariff is always fixed per case, and is 10*d.* to 1*s.* to England; 1.25 M. (1*s.* 3*d.*) to Germany, and 1.03 Fl. (1*s.* 8 ½*d.*) to Holland. The principal English importing centres are: London, Liverpool, Hull, Manchester, Glasgow, Bristol, Newcastle and Cardiff.

The relations at the present time with the markets of Russia and Austria are indirect, being carried on through the agency of intermediaries in those countries, where Spanish produce has to face the very keen competition of the Italian article.

The endeavour is now being made, especially by a Castillian co-operative society, to open up the Russian market for Spanish oranges, this market being at the present time, especially in the south, almost monopolised by Italian products. During the last few years about 500 000 cases per annum of Valencia oranges have been imported into Russia, but indirectly, via Hamburg. In the latter place cases are opened, goods selected, once more put up in cases and forwarded to Russia by Russian traders. The port of Odessa is very important to the citrus trade, as it supplies the whole of the other ports in the Black Sea, Southern Russia, the Caucasus etc. The Odessa market is almost monopolised by Italian citrus produce (especially lemons), among which appear 1 500 000 cases of oranges per year.

The only steamers running from Valencia to Odessa are those of the Adria Company, which however put in at Marseilles or Genoa, Trieste and Fiume and always take more than 15 days on the voyage. The cost of transport is about 1*s.* 7*d.* per case, or 10 % of the value of the goods. The Russian customs duty on Spanish oranges is 1 rouble per pood (6*s.* 6*d.* per cwt.) gross weight, without any deduction for the packing, so that sometimes the oranges are forwarded in sacks. The customs duties are in fact rather high and result in an increase of 5 % of the selling price in Holland and of 3 M. per quintal (1*s.* 4*d.* per cwt.) in Germany; 5 fr. per quintal (2*s.* per cwt.) in France; and 9 fr. per quintal (3*s.* 7 ½*d.* per cwt.) in Belgium. The cases which find the best sale in Odessa are those of 64,80 and 150 oranges; the variety fetching the highest price, especially towards the end of the season, is that with oval fruit. In view of the incomparable superiority of the Spanish orange over all others, it has succeeded in ousting the competition of the Italian orange in Hamburg, and even in Odessa it sells advantageously, outdistancing its competitors in the shape of Jaffa, Alexandria and Tripoli oranges.

About three years ago the Spanish " Orange Federation " was formed, which is based on the union of co-operative societies (16 at the present time). Each co-operative society undertakes to collect and box the oranges of its members and delivers them to the Federation, which attends to shipment and contracts the transport tariffs for the year with the navigation companies. In London, Liverpool, Hamburg and Antwerp the Federation has a representative who is entrusted with the receipt, marketing and sale of the goods.

The exportation of Spanish oranges, although in continuous increase, does not nevertheless keep pace with the increase of production; the problem of the expansion of the home market is therefore a pressing one. The oranges consumed at Bilbao, says the Author, come from Valencia and have been reforwarded from London or Liverpool. A serious obstacle to home trade is presented by the high transport rates: from Valencia to Cadiz 1.03*d.* per ton per mile, from Valencia to Madrid 1.99*d.* per ton per mile; from Yátiva to Valencia 2.78*d.* per ton per mile. At a meeting held in Valencia at which the Author was present, the wish was expressed that oranges should be transported by Spanish railways along the shortest route at a speed of about 12 miles per hour, including change of lines and stoppages, at a rate of 0.82*d.* per ton per mile up to 188 miles, 0.65*d.* up to 625 miles, and 0.39*d.* for journeys exceeding 625 miles.

In conclusion, the measures suggested by the Author for the promotion of the Spanish trade in citrus fruits are: getting rid of foreign middle-men, opening up new markets, the Russian in particular, the provision of facilities for internal transport, and steps directed to fostering home consumption; finally, the construction of a good port at Burriana, one of the principal points of shipment of oranges (1 600 000 cases per year).

CALABRÒ, L. **The Advantages and Disadvantages of Forcing, and the Yield of Citrus Plantations devoted to the Production of " Verdelli ".** (Pregi e disfetti della forzatura e rendimento degli Agrumeti destinati a verdelli). — *L'Agricoltura italiana.* Pisa, 16 giugno 1912. **1192**

Italy: Sicily

The system of forcing citrus trees has been adopted at the right moment to improve the condition of the Sicilian groves, which had suffered greatly from foreign competition, and also to regulate the supply and demand, for at certain seasons the supply had been so great that the fruit was sold at prices which did not cover the cost of production. Thanks to the new system of cultivation, and to the " Camera Agrumaria " (Chamber of Citrus-growers), the prices have risen so much that last year the winter fruit was sold at 13 lire (10s. 5*d.*) per 1 000 and the " verdelli " at 55 lire (43*s* 6*d*) per 1 000.

Forcing has not only encouraged the growers to adopt rational and intensive measures of cultivation, but has also been of great advantage to the labouring class, whom it has provided with occupation at a season when, in Sicily, there is no other agricultural work to be done.

The new system, however, presents some disadvantages, of which the most serious is the shortening of the life of the tree. The latter becomes weak and easily falls a prey to various diseases, particularly gummosis. In groves where forcing is carried out, the loss of trees exceeds by one third that under ordinary methods of cultivation. The crop-bearing period has been reduced from about 90 years to 60 years.

In order to show the increase in yield which can be obtained in a lemon-grove in full bearing by means of alternative recourse to forcing, in comparison with the crop from one treated in the ordinary manner (leaving out of account the shortening of the life of the tree), the writer gives the cultural expenses, compiled from the economic data collected during a period of four years, of a grove situated in the neighbourhood of Fiumefreddo (Catania), which has been established for nearly 30 years upon vulcanic soil.

The figures are as follows :

Lemon-Grove subjected to forcing.

Cost of cultivation per acre containing 160 *trees.*

	$	£	s	d
Filling in basins round trees: 16 days at 34 c. (1*s*. 5*d*)	5.40	1	2	0
Manuring (every other year) for 160 trees:				
Dung, 176 lbs. per tree (28 200 lbs. per ac.) at $1.75 per ton. (8*s* per English ton.)	25.00	5	2	6
Sulphate of potash, 14 oz. per tree (140 lbs. per acre), at $ 2.50 per cental (£11.5*s* per ton.)	3.50	—	14	6
Mineral superphosphate, 3 ¼ lbs. per tree (530 lbs. per acre), at 70 c. per cental (£ 3.5*s* per ton.)	3.70	—	15	6
Gypsum, 4 ½ lbs. per tree (710 lbs. per acre), at 17c per cental (16*s*. per ton.)	1.20	—	5	0
Sulphate of ammonia, 1 ³/₄ lbs. per tree (285 lbs. per acre), at $ 3.35 per cental (£15.6*s*. 8*d* per ton.)	9.85	1	19	0
Nitrate of soda, 7 oz. per tree (70 lbs. per ac.), at $ 2.65 per cental (£ 12 per ton.)	1.85	—	7	0
Carting and spreading dung and chemicals: 8 days at 20c. (9 ³/₄*d*)	1.60	—	6	6
Digging under manure and digging out basins and channels: 12 days at 34c. (1*s*. 5*d*)	4.10	—	17	0
Spreading nitrate and sulphate of ammonia: 1 ²/₃ days at 34c. (1*s*. 5*d*.)	0.55	—	2	3
Total for two years	$ 56 75	£11	12	6
	$	£	s	d
Annual expense (half of above)	28.35	5	16	3
Levelling and keeping in order of basins and channels: 8 days at 34c. (1*s*. 5*d*.)	2.70	—	11	3
Two shallow hoeings: 12 days at 34c. (1*s*. 5*d*.)	4.10	—	17	0
Labour on irrigation	2.70	—	11	3
Pruning and trimming every third year: annually 6 days at 53c. (2*s*. 2*d*.)	3 20	—	13	0
Autumn ploughing to break up and level the soil: 2 days at $ 1.15 (4*s*. 9*d*.)	2.30	—	9	6
Superintendence and incidental expenses	3.20	—	13	0
TOTAL	$ 46.55	£9	11	3
Returns per acre.	$	£	s	d
Average annual yield of 725 " verdelli " per tree: 117 000 averaging $ 6.75 (28*s*.) per thousand.	792.00	162	17	0
Average annual yield of 300 lemons per tree: 48 000 averaging $ 1.55 (6*s*. 4*d*.) per thousand.	74.20	15	8	0
Total	866.20	178	5	0
Less cost of production	46.55	9	11	3
GROSS RETURN	$ 819.65	£168	13	9

Lemon-Grove cultivated in the ordinary way.

Cost of cultivation per acre containing 160 *trees.*

	$	£	s	d
Winter ploughing about 4 in. deep: 2 days at $1.15 (4*s*. 9*d*).	2.30	—	9	6
Pruning, trimming and gathering every three years: annually	3.30	—	13	3
Rational manuring (as for forcing) every three years: $46 (£9.4*s*. 6*d*).	—	—	—	—
Spreading dung and chemicals: 8 days at 20c. (9 3/4*d*.) = $1.60 (6*s*. 6*d*.)	—	—	—	—
Filling in basins and digging in manure: 12 days at 34c. (1*s*. 5*d*.) = $4.10 (17*s*. 0*d*)				
Total cost of above: $51.70 (£10.8*s*)				
Annual cost	17.20	3	9	3
Spring ploughing: 2 days at $1.15 (4*s*. 9*d*.)	2.30	—	9	6
Hoeing in June, and digging basins: 14 days at 34c. (1*s*. 5*d*.)	4.75	—	19	9
Three shallow hoeings in summer: 18 days at 34c. (1*s*. 5*d*.)	6.10	1	5	6
Cost of irrigation from June to October	3.50	—	14	3
Incidental expenses	3.10	—	12	9
TOTAL	$42.55	£8	13	9

Returns per acre.

	$	£	s.	d.
Average yield of 1 300 lemons per tree: 210 000 averaging $1.55 (6*s*. 4*d*.) per thousand	322.40	65	15	0
Less cost of production	42.55	8	13	9
GROSS RETURN	$279.85	£57	1	3

It thus appears that the difference in the returns from the two systems is sufficient to compensate largely for the disadvantages entailed by forcing and to justify the recommendation of this system.

SAVASTANO, LUIGI. **Cultivation of Pome and Stone Fruits in Southern Italy.** (La coltivazione delle pomacee e delle drupacee nel Napoletano. Studio critico). — *Atti del R. Istituto d'Incoraggiamento di Napoli*, Serie sesta, Vol. LXIII degli Atti, pp. 1-98. **1188** **Italy**

This work is divided into four parts: 1. Fruits for export and orchards for growing them; 2. Stone Fruits; 3. Pome (Hard) Fruits;

4. Conclusions. Appended is an analytical bibliography arranged under 23 items.

Fruits for exportation and orchards for growing same.

Except with regard to almonds, figs, walnuts, hazelnuts and the citrus fruits, fruit-growing in Southern Italy takes the form, from the economic standpoint, of supplying local consumption; but the region near Naples and that of Bitonto in Apulia are exceptions, in that they have a large production for export both to other Italian provinces and abroad.

Grapes, figs and oranges form the basis of fruit consumption in the coastal and hilly central region of Southern Italy; the belt of the hard fruits (apple and pear), on the other hand, is the High Apennines.

Citrus fruits, almonds and hazelnuts are cultivated in specialised orchards growing specified market types; the other fruits are grown in mixed orchards in common types.

The new guiding ideas in the growing of pome and stone fruits in the south must be based above all on the question of transport, which for these fruits takes place principally by railway and subsidiarily by sea. The coast railways (Naples-Reggio, Lecce-Foggia, Brindisi-Reggio and Formia-Caianello) are the citrus and early fruit carrying lines; the Apennine railways (Naples-Rome, Naples-Foggia, Naples-Avellino-Benevento, Naples-Metaponto, Castellammare Adriatico-Rome, Naples-Isernia-Sulmona-Aquila-Rome) might form the lines for transporting the apples and pears (winter fruits). Sea transport is only of importance for fresh fruit as regards the trade with Egypt, Malta, Tunis and Algeria.

Except for the region surrounding Naples (including the provinces of Caserta, Avellino and Salerno) where there are some homogeneous orchards, and exclusive of the province of Bari in respect of almonds, fruit trees are generally grown scattered about. Grafting is rare; pruning is done badly or not at all. The wide scattered method of cultivation, however, frequently allows the trees to assume a good natural form, and imparts wonderful health to them. Parasites are rare, and constitutional diseases still rarer. Except for a very few varieties selected commercially at Naples and Bitonto (Bari) the rest presents quite a mixture of types. " The study required is that of selection of the varieties to be grown... and afterwards commercial study. "

The study presented by the Author is preliminary, and may to a great extent be regarded as an elimination of the varieties unsuitable for exportation.

Enumerating the localities suitable for new plantation, the Author notes that some of the best adapted are nevertheless malarial. The fruit plantation, however, which requires work of regularizing the soil, would contribute to the diminution of the scourge. Until a few years ago the plantation devoted to a single fruit was regarded as the best, " but it is precisely this best which has led to the existing pathological conditions. " The new plantations therefore should be mixed, but of definite arrangement.

The potentialities of Southern Italy in respect to fruit-production may be described as unlimited, but " until Neapolitan fruit-growers are persuaded that selling the fruit is more difficult than producing it, and consequently endeavour to solve the commercial problem, it will not be desirable to increase the area ".

A long chapter is devoted to the study of packing and consideration of local methods as compared with the best foreign methods.

Stone Fruits. — General survey: exportation, production, nurseries. Peach, apricot, cherry, plum. Drying and packing of the fruits. Almond.

For each fruit the following are described: extension of cultivation, grafting, plantation, after-cultivation, industries, and diseases and pests if any. There are given: a descriptive catalogue of the principal peach-varieties of Campania; a list of peach-varieties of Reggio Calabria; a catalogue of cherry-varieties in the valley of Baiano (Avellino); a catalogue of cherry-varieties of the province of Naples; a list of the varieties in Reggio Calabria, a list of the varieties of plums in the provinces of Naples and Reggio Calabria.

Pome Fruits. — Apple; pear; secondary species (Japanese medlar, quince); packing, preservation, refrigeration. Each species is dealt with in the same order as those in the previous chapter. There are given: descriptive catalogues of the apple-varieties of the provinces of Naples and Avellino; lists of the apple-varieties of Avellino, Scerni, Campobasso, Agerola, Reggio Calabria and Melfi; descriptive catalogues of the pears in the province of Naples and the surrounding regions, the province of Campobasso and that of Avellino; notices on the pears of Pozzuoli (Naples), a list of the pears of Bari, Giffoni (Salerno), Scerni (Abruzzo), Massafra (Lecce), Agerola (Naples) and Reggio Calabria.

The general *conclusions* (and special ones for each of the species considered), as enumerated above, are summarised as follows:

" If it is desired to increase the production of pome and stone fruits in Southern Italy, this will not be secured except by increasing the consumption, and the latter will be brought about automatically by greater cheapness of price to the consumer.

This will be obtained by a study of the following problems:

1. Endeavouring to attain the double end of selling the fruit at a price reasonable for the grower and the consumer: this will not be secured except by reducing the number of middlemen as far as possible. This latter is the essential condition.
2. Improving the packing.
3. Commercial selection of the varieties and production of fresh ones.
4. Organisation on an industrial footing in order in particular to produce dried fruit with a view to facilitating winter consumption of fruits by economical production.
5. Improving the good growing systems and spreading them in regions where they are neglected.

All these various problems may be regarded as having been taken in hand, but it is essential to extend them to a much wider circle, experimenting and studying not only in the plantation but likewise on the consuming markets.

1184 CORLEO, S. S. **Importance of the Cultivation of Manna Ash in Italy.** — *Il frassino da manna e la sua coltivazione* (1), 76 pp. Palermo, 1912.

Italy

The area under manna ash in Italy is about 10 000 acres, almost all in the province of Palermo. In the period 1900-1910 the exportation of manna was 2 499 tons, of a total value of £380 550; the importation was only 17 ½ tons, worth £2 888, without reckoning that consumed in the country and by the mannite factories. In fact the development of the industrial production of mannite encourages the production of manna, the price of which has gone up considerably since 1901; thus for the "cannolo" quality it has risen from 1s. 9*d.* to 5s. per lb., for "rottame" from 10 ½*d.* to 2s. 6*d.*, and "in sorte" from 5*d.* to 1s. 3*d.* The production has also shown a slight but regular rise, the exportation being in 1901 173 tons, worth £34 900, and 1910 307 ½ tons, worth £55 803 10s.

As a means of judging the economics of growing this tree, the following two typical examples from Cefalù (I) and Palermo (II) are given:

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(1) See also: D. TAMARO. *Trattato completo di agricoltura, Frassino*, pp. 837-839. Milano, 1912. V. VILLAVECCHIA. *Dizionario di Merceologia*, 3ª Ed. Vol. I, Frassino, Manna, pp. 1010 and 1430-1431. Milano, 1911.

Installation-Capital and Interest per Acre.

Preparation of the land and planting.

	I.		II.	
	s.	d.	s.	d.
Ploughing	9	7	11	2
2 000 trees (I at 15*s.* 10*d.* per thousand; II at 17*s.* 4 ½*d.*)	31	11	35	2
Planting: 12 men (I at 1*s.* 7*d.*; II at 1*s.* 9*d.*)	19	2	21	1
Three hoeings (I, 14 men at 1*s.* 7*d*; II, 12 men at 1*s.* 9*d.*)	21	9	21	1
Gapping up	3	10	—	—
Minor expenses	—	—	5	9
Total . . .	£4 6	3	£4 14	3

Annual upkeep expenses for eight years till trees come into bearing.

	I.		II.	
	s.	d.	s.	d.
Three hoeings (14 men at 1*s.* 7*d*) . . .	21	9	—	—
Two hoeings (9 men at 1*s.* 9*d*)	—	—	16	0
Minor expenses	3	3	5	0
Total . . .	£1 5	0	£1 1	0

Cost of plantation brought up to bearing.

	I.			II.		
	£	s.	d.	£	s.	d.
Planting, with compound interest at 5 % (I, £4, 6*s.* 3*d* ; II. £4, 14*s.* 3*d*)	6	7	4	6	19	1
Eight years of upkeep, with compound interest at 5 % (I, 25*s* ; II, 21*s.*)	11	17	9	10	3	0
Eight years' rent, with compound interest at 5 % (I, 11*s.* 3*d.*; II, 13*s.* 6*d.*)	5	6	8	6	8	0
Total expenses per acre to the ninth year	£23	11	9	£23	10	1

Yield of manna from first years' crop.

	I.			II.		
	£	s.	d.	£	s.	d.
" In sorte " at 2*s.* 11*d.* per lb. (I, 66 lbs.; II, 64 lbs.)	9	11	6	9	3	10
" Cannolo " (I, 10 ½ lbs. at 5*s.* 9*d.*; II, 9 lbs. at 5*s.* 5*d.*)	3	1	3	2	7	11
Total . . .	£12	12	9	£11	11	9

From these figures, from which must be subtracted the cost of collecting (which varies according to the season) and various minor expenses, a good idea is obtained of the profitable return from manna ash plantations; it should further be remembered that this tree will do on poorish soils not suitable for other crops.

Although the manna ash (*Fraxinus Ornus* L.) is specialised for manna production, it also yields a timber much like that of common ash (*F. excelsior* L.); the latter has quite recently been used to produce manna on some small areas, though generally only grown for timber.

There are also the so-called Calabrian manna, obtained from *Fraxinus rotundifolia* Lamk., and the Maremma manna, neither of which is of much importance either for quality or quantity.

1185 NAGY, ENDRE. **Apple Store-house of the Agricultural Association of the Comitat of Szolnok-Doboka, Hungary. Results of its First Year's Work.** (A Szolnok-Dobokavármegyei Gazdasági Egylet almaraktárának elsö éve).—*Köztelek*, XXII ev., 43 szàm, pp. 1604-5, 6. Budapest 1912, Junius hó 8.

Hungary

In the autumn of 1911, the crop of winter apples at Szolnak-Doboka amounted to 396 railway trucks, worth from £16 660 to £19 760. As the population of this comitat lives almost exclusively on the revenues drawn from its orchards, and defective handling had reduced the value of the choicest apples such as Rouge de Stettin, Reinette ananas, Parmen d'or, Nemes de Sóvár to the level of that of second or third rate cider apples, the agricultural association of the comitat decided, in the autumn of 1911, to attempt to reestablish the reputation of its apples.

With the financial assistance of the Ministry of Agriculture, the two cellars of the seat of the Association at Dés were transformed into an apple storehouse provided with moveable shelves of deal laths. These shelves have cane bottoms resting on three iron bands and they can hold from 26 to 30 lb. of apples, each, so that a stand of 30 shelves contains from 800 to 900 lb. of apples.

Knowing the reluctance of farmers to warehousing their produce, the association offered to buy directly at a price of 9*s* 8*d* to 10*s* 2*d* per cwt. the five above-mentioned varieties of apples provided they were sound and without blemish, and the small landowners availed themselves freely of the offer.

The cement floorings of the cellars were frequently watered and the apples were sorted once a week. The most favourable temperature for the good preservation of apples is + 2 to 3° C.

The sale of the apples began on November 26 at prices of from £1 3*s* 3*d* to £1 5*s* 5*d* per cwt. free at the Dés railway station; towards the end of February they rose, and at the beginning of March reached £1 18*s* 1*d* and £2 2*s* 4*d*. Considering the average purchase price the profits would have been considerable if the whole quantity stored had been sold, but the wastage by rotting and drying up must be deducted and this is shown by the following table :—

Varieties	Quantity observed lb.	Rotted %	Dried up %	Total loss %	Stored — 1911		End of sale
					Beginning	End	
Reinette d'Ananas	332	5.1	8.4	13.5	October 5	October 9	Dec. 11, 1911
Parmen d'Or .	583	4.1	11.1	15.2	Sept. 26	» 19	» 20, »
Batul	3729	18.8	9.0	27.8	» 21	» 14	April 5, 1912
Nemes de Sóvar	359	9.6	10.1	19.7	» 29	» 19	» 5, »
Rouge de Stettin	1800	16.5	7.5	24.0	» 25	» 19	» 6, »

The average of the quantities of rotten and dried up apples corresponds to the average of the quantities stored.

Thus notwithstanding the low average purchase price (9*s* 2*d* per cwt.), the cost of handling, packing and carriage to railway brings it up to a total of 16*s* 11 3/4 *d* per cwt., reducing the profit by 4*s* 8 1/4 *d* on the price of sale of £1 1*s* 7*d* per cwt. Considering only the latest prices realised the profits of course are much greater.

FORESTRY.

1186

Vogel. **Returns and Working-Expenses for the State Forests of the Kingdom of Saxony in 1910.** (Die Reinertragsübersichten der Kgl. Sächs. Staatsforsten für das Jahr 1910). — *Tharandter Forstliches Jahrbuch*, 63. Band, 2. Heft, pp. 143-157. Berlin, 1912.

Germany: Saxony

The State forests of Saxony are, next to those of Württemberg, the most profitable in the German Empire, and consequently in the world.

The following table gives an analysis of the returns, first the totals, and then the figures for the forests showing respectively the largest and smallest net returns per unit of area:

		Total	Largest	Smallest
Area under forest, acres		426 286	46 994	2 915
Possible yield of wood over 2 $^{3}/_{4}$ in. diameter	total . . . . . . cub. ft.	30 907 000	3 825 000	151 800
	utilisable timber cub. ft. . . .	24 581 000	3 298 000	120 000
	utilisable timber % of total .	80	—	—
Wood over 2 $^{3}/_{4}$ in. diameter felled	total . . . . cub. ft.	30 546 000	3 690 600	150 400
	utilisable timber cub. ft.	25 680 000	3 298 800	123 600
	utilisable timber % of total . .	84	89	82
		£ s.	£ s.	£ s.
Receipts	timber	769 474 7	109 147 11	3 696 5
	secondary products. . .	5 775 2	113 4	21 14
	total	775 249 9	109 260 15	3 718 0
Expenses	wages of woodcutters .	113 544 4	15 463 3	597 13
	forest improvements. .	22 418 4	6 907 19	606 16
	working	60 467 2	1 423 6	216 0
	management and protection	125 012 4	12 456 8	1 020 6
	total	321 441 13	36 250 16	2 440 15
Net returns	total.	£453 807 16*s.*	£73 009 19*s.*	£1 277 16*s.*
	per acre	£1 1*s.* 3*d.*	£1 11*s.* 1*d.*	8*s.* 9*d.*
	per 100 cub. ft. of wood over 2 $^{3}/_{4}$ in. diameter, stumps and branches	£1 9*s.* 8½*d.*	£1 9*s.* 7*d.*	16*s.* 11½*d*
Forest capital	capital.	£20 754 870	£2 698 060	£134 775
	rate of interest.	2.19 %	2.71 %	0.95 %

The figures for the forest giving the smallest returns per unit of area are from the reserve annexed to the Forestry College of Tharandt, while those for the largest are from the forest district of Schwarzenberg, which has a wooded area slightly above the average.

Under expenses for forest improvements the principal items are for seeding and planting; in 1910 these were carried out on a total area of 6 668 $^{3}/_{4}$ acres, of which 287 ½ were seeded and 6 381 ¼ planted. The costs per acre were:

	Average	For largest total cost	For smallest total cost
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Seeding	1 16 0	2 11 4	1 6 10
Planting	2 2 2	1 13 3	1 14 0
Total (without general expenses)	2 1 11	1 14 11	1 13 2
Total (with general expenses)	2 19 8	4 0 0	2 5 7

The highest cost of regeneration (including general expenses) is again from the Tharandt reserve; the highest cost for seeding is, however, from the district of Bärenfels, *viz.* £2 17*s.* 8*d.*; and the highest cost of planting is from the forest district of Auerbach, *viz.* £2 11*s.*: this district also had the highest total cost without general expenses, *viz.* £2 10*s.* 11*d.* It is thus seen that the general expenses are responsible for the high figure from Tharandt. The lowest total cost, including general expenses, is from the district of Dresden, and occurs with the lowest cost of seeding and planting respectively and together.

The data referring to the cultural expenses for conifers are of practical value. The highest cost per acre is £4 2*s.* 11*d.*, occurring with the highest cost per 100 trees in the plantation, *viz.* 3*s.* The lowest cost per acre is 18*s.* 7*d.*, occurring with the lowest per 100 trees, *viz.* 8*d.*

The Forests of Turkey. (Waldbestände und der Holzhandel in der Türkei). — *Continentale Holz-Zeitung*, XXIV Jahrgang, Nr. 25, pp. 221-222. Wien, 22. Juni 1912. 1187

On the basis of a report of the Turkish Ministry of Mines and Forests (1) respecting the forests of Turkey, the condition of the forest district may briefly be described as follows:

Turkey

The total wooded area of the whole Turkish empire is estimated at 21 745 300 acres. Of these, 88.03 % belong to the State, 1.23 % are in mortmain, 1.66 % belong to the Communes, 6.13 % to private individuals and the ownership of 2.96 % is uncertain.

Of the area under forest, the following percentages are covered by these species:

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(1) According to the *Annuaire Oriental* 32^{e} *Année*, 1912, pp. 79-81, there are: Ministry of Commerce and Agriculture (Tidjaret vé Ziraat Nezaréti), General Direction of Forests (1 General Director, 3 General Controllers); Ministry of Finances (Malié Nezaréti), General Direction of Domains; Ministry of Charitable Funds (Evkaf Houmaizoum Nezaréti), Forests and Vakoufs-Lands Section. (*Ed.*).

	%		%		%
Spruce	13.72	Poplar	1.30	Alder	0.73
Beech	11.19	Olive	1.21	Lime	0.73
Silver fir	9.64	Chestnut	1.14	Box	0.58
Hornbeam	5.06	Elm	1.14	Birch	0.38
Ilex	3.67	Ash	0.97	Gall-Oak	0.18
Cistus	3.04	Velani-Oak	0.83	Elecampane	0.12
Laurel	1.53	Plane	0.79	Cypress	0.12
Pine	1.44				

As is shown, nearly nine-tenths of the forest belong to the State, which, however, turns it to little account, and even allows the herdsmen to burn it down, while the peasants and woodcutters destroy the trees in a ruthless manner. A State Forestry Department is practically non-existent. There is only a department of the Ministry, and scarcely any foresters or rangers are to be found in the woods. There is also no sign of any improvement in the matter.

The Turkish Government has given permission to the mitred Abbot of the Mirdites to exploit, for 15 years, the magnificent oak forests in the territory of the Mirdites, and Prince Bib Doda sold, two years ago, a large forest near lake Scutari, to some Italians, who have organized the exploitation of its resources.

LIVE-STOCK AND BREEDING

HYGIENE.

1188 WULFF, F. **Diagnosis of Anthrax by Examination of the Spinal Marrow.** — *Berliner Tierärztliche Wochenschrift*, XXVII. Jahrgang, No. 24, pp. 421-423. Berlin, 13. Juni 1912.

Germany

The Author discusses several new methods which serve for the detection of the anthrax bacillus in dead animals. He does, it is true, acknowledge that some of them enable good results to be secured, but the implements and auxiliaries required for preserving the material to be examined (gypsum rods, paper rolls, test tubes, etc.) are not always to hand, and it is consequently again and again found that the anthrax bacilli in the samples taken perish and can no longer be detected.

According to the Author's enquiries the spinal marrow forms a very suitable object for demonstrating anthrax. He produced plate cultures using for this purpose marrow from the metacarpus, the metatarsus and the tibia. A small piece of the marrow was ground and placed in a Petri dish and agar was poured over. In all cases the existence of anthrax bacilli was successfully shown, even in those instances where 7 to 14 days had already elapsed since the death of the animals and the bones had during this time been lying in the earth.

ORESTE, PIETRO. **Anti-Anthrax Serum.** (Siero anticarbonchioso). — *Atti del R. Istituto d'Incoraggiamento di Napoli,* Serie sesta, Vol. LXIII degli Atti, pp. 101-102. Napoli, 1912. **1189**

Italy

After referring to the prophylactic methods against anthrax (by means of vaccination and by serums), and after mentioning the immunisation serums of Sclavo, Deutsch and Sobernheim, the Author passes on to describe the method by which, under his direction, Dr. Cacioppo prepared a new serum which is said to have proved considerably more successful than its predecessors.

Dr. Cacioppo used the donkey as the serum-producing animal. He began to make it immune with Pasteur's vaccine 2, but after the injection of two divisions of the Pravaz syringe followed by half a syringe of the same vaccine, the subject of experiment showed no local reaction, not even thermic reaction. Then in order to immunise the animal he began by inoculating it with an exceedingly small quantity of virulent culture of anthrax, which produced a rise of temperature (from 37° to 42°) and at the point of inoculation a hot painful swelling which in a short time extended to the lateral region of the neck and the entire region of the shoulder. By the internal administration of creoline and subcutaneous injections of tincture of iodine beneath the whole area of the tumour, the temperature was brought down to the normal limit and the swelling disappeared. The inoculations of virulent culture were repeated several times, so that finally one litre of culture of anthrax in broth was injected into the subcutaneous connective tissue in various parts of the body and in a single operation. After this, extraction of the blood and removal of the serum was begun. The latter injected into rabbits and sheep showed a high immunising power.

Dr. Cacioppo proposes to continue experimenting with his serum, on an extensive scale.

STANDFUSS. **The Control of Scouring in Calves by Means of Yoghurt** (1). (Die Bekämpfung der Kälberruhr mittels Yoghurt.) **1190**

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(1) Sour milk prepared by a ferment "Maya," which contains three distinct kinds of bacteria. Cf. A. MONVOISIN: *Le Lait, son Analyse, son Utilisation.* (Paris, 1911). See *B.* Feb. 1912, No. 402. (*Ed.*).

Sonderabdruck aus: *Landwirtschaftliche Wochenschrift für die Provinz Sachsen*, No. 7, 1912. Halle a. S., 1912.

Germany

The author recommends Yoghurt as a means of controlling scouring in calves. He attributes to this preparation a threefold action:

1. When it is given to a calf the Yoghurt bacteria produce in its intestines a great quantity of lactic acid, which acts as a disinfectant and prevents the development of pathogenic bacteria. At the same time the activity of the intestine is stimulated.

2. The Yoghurt bacteria by means of their abundant development hinder the multiplication of other bacteria.

3. It is probable that the Yoghurt bacteria produce a ferment which destroys the bacilli causing scour in calves.

The author has succeeded in raising the vitality of his cultures of *Bacillus bulgaricus* to such an extent that milk treated with them, at a temperature of 45° C., coagulated in two to three hours, that is, became Yoghurt. He considers such rapid reproduction and vital energy of the Yoghurt bacteria as especially valuable and recommends that calves be treated with Yoghurt in which *Bacillus bulgaricus* has already multiplied to a great extent, but which has not yet curdled.

The formation of lactic acid takes place then in the stomach and intestines of the calf and produces its full effects. The administration of Yoghurt to the calves from the first to the fifth day of their life seems to be sufficient.

According to information contained in No. 23 of the above periodical good results have attended the use of this remedy.

1191 WATERSTON, JAMES. ***Haematopinus vituli*, L. (= *tenuirostris*, Burm.), in N. Mavine, Shetland.** — *The Entomologist's Monthly Magazine*; Second Series, Vol. XXIII, No. 267, pp. 64-65. London, March 1912.

Great Britain: Shetland Is.

" This peculiar louse occurred in extraordinary numbers during October last on a white calf belonging to a crofter in this neighbourhood. The animal suffered extreme discomfort for ten days and lost rapidly in condition, being latterly unable to sleep or rest. Small sores also formed, partly through the sucking of the parasite, and partly through the beast's rubbing against every hard object in his way. The crofter's treatment of the attack, a liberal application of flowers of sulphur, was quite effective. By the second day, the lower parts of the fore-limbs, which had received less attention, were black with dead or dying lice, and within a week ", apparently, the animal was clean.

ANATOMY AND PHYSIOLOGY.

BERTRAND, GABRIEL and MEDIGRECEANU, F. **Normal Manganese in the Blood and the Presence and Distribution of Manganese in Animal Organs.** — *Comptes-Rendus des Séances de l'Académie des Sciences*, Tome 154, No. 15, pp. 941-943; No. 22, pp. 1450-1452. Paris, 9 avril, 28 mai 1912. **1192**

France

The Authors set on foot investigations into the occurrence of manganese in the blood of man, other mammals and birds, and also in the various organs of mammals, birds and fishes. Bile, milk and eggs were also tested in respect of manganese contents. The method of investigation is more fully described in No, 15, p. 952, of the above named Proceedings of the Academy of Sciences; it admits of the detection of 0.002 mgr. of manganese.

The presence of manganese was successfully demonstrated in the blood of man and the higher mammals, but in such small quantities as to represent only a few hundredths of a milligram per litre of blood. The richest was the blood plasm (in the sheep); the blood corpuscles contained less; in haemoglobin (that of the horse) no manganese could be found.

The examination of the organs related to various parts of the digestive, respiratory and genital apparatus, internal secretion glands, bone, muscle, fat and nerve tissue, the skin, the hair, feathers and eyes.

More than 150 separate investigations were made; the results are as follows:

1) With the exception of the white of birds' eggs all the animal organs and products examined contained manganese, (generally a few hundredths or thousandths of a milligram per 100 grams of fresh substance).

2) The same organ shows no great variations of manganese contents in different individuals of the same species. These differences are likewise not great where the same organs of different species are in question; they are nevertheless recognisable.

3) Among functionally important organs or tissues, the uterus of birds contained most manganese (0,786 to 2,201 mg. per 100 gr. of substance). Generally the organs of the bird exhibited a higher content of manganese than those of mammals. The smallest quantity of manganese was found in the lungs and in the muscle and nerve tissue, but in the grey matter (brain of the ox) more manganese was found than in the white matter.

Milk is very poor in manganese. In the white of birds' eggs it could not be detected at all, appearing only in the yolk.

FEEDS AND FEEDING.

1198 FINGERLING, GUSTAV. **The Effect of Organic and Inorganic Phosphorus Compound on Milk Secretion.** (Einfluss organischer Phosphorverbindungen auf die Milchsekretion). — *Biochemische Zeitschrift*, Band 39, 3. u. 4. Heft, pp. 239-269. Berlin, 1912.

Germany

Experiments were made on two goats, and lasted for 8 months; in both cases they were divided into preliminary periods and those of actual experiment, the number of which was 8 for goat *A*, and 6 for goat *B*.

The rations given were poor in phosphoric acid and were as follows, per head and day:

Straw	1 lb.	Starch	13 oz.
Blood albumen	9 oz.	Common Salt	1/3 oz.
Molasses	7 oz.	Calcium carbonate	1/3 oz.
Earthnut oil	2 oz.		

During one period, this ration only was fed; during all the others the animals were also given an organic or inorganic compound (lecithin, phytin, casein, nuclein, sodium nucleate, disodium phosphate). The amount of these compounds was so regulated, as not entirely to satisfy the phosphorus requirements of the goats.

Analyses were made of average samples of excrement and urine, as well as of milk and the results are given in exhaustive tables.

The figures obtained for goat *A* remained nearly constant throughout the whole time; those referring to goat *B*, showed somewhat greater variability, but did not exceed the limits of error.

The writer summarizes the results of his work as follows:

1. None of the organic or inorganic phosphorus compounds used had any specific influence upon the activity of the mammary glands.

2. The phosphorus compounds used did not increase the milk yield, nor alter the composition of the solids in the milk.

3. The absolute and percentage contents of lime and phosphoric acid remained the same.

4. Inorganic phosphorus satisfied the goats' need of phosphorus as well as organic; the effects of the two forms were alike.

This is a further proof (1) that the animal organism is capable of using inorganic phosphorus compounds. Thus, a ration which is poor in phosporus can be improved by the addition of inorganic phosphates, so as to be suitable for animals which, like milch cows, require much phosphorus.

BREEDING.

1194 **Germany**

WEBER, E. **In-Breeding, treated from the Point of View of Breeding Experiments.** (Die Verwandtschaftszucht, behandelt auf Grund von züchterischen Versuchen). — *19. Flugschrift der Deutschen Gesellschaft für Züchtungskunde.* Berlin, 1912.

The writer speaks, in the first place, of the results which have hitherto been attained by in-breeding and considers it to have been most successful in the cases of the creation of the Shorthorn and some of the English and American breeds of dogs. The Austrian Imperial Court Stud, Kladrub, in Bohemia, can also show good results from a hundred years' in-breeding. At the Royal Farm at Rosenstein, near Stuttgart (Germany), however, this system applied to cows, though at first successful, led subsequently to loss of productiveness, decreased fecundation, as well as injury to health and decrease in weight. Similar effects were obtained in in-breeding experiments with rabbits, rats and mice.

In connection with these investigations, mention is made of the late Professor Pusch's experiments at the Veterinary College at Dresden, on the results of interbreeding between near relatives in the case of goats.

Nine male goats and 18 female were used and 42 matings made, which resulted in 77 kids. The different matings were as follows:

1) 12 matings of 6 goats with unrelated animals resulted in 26 kids, of which 25 were normal ; and 1 (= 3.8 %) was abnormal.

2) 9 matings of nearly, or less nearly, related goats produced 18 kids ; 15 of these were normal ; 3 (= 16 %) were abnormal.

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(1) In Band 38, Heft 5 and 6, pp. 448-467, of the above mentioned periodical, the writer gives an account of an experiment on ducks, to which he only gave inorganic phosphates in their rations. The birds laid in the usual manner; the amount of phosphorus compounds in the eggs was too great to have been derived from the reserve materials of the body of the duck. It must be supposed that these phosphorus compounds were built up from inorganic material by the organism of the ducks under experiment.

3) 8 matings of son and mother, in the case of 3 goats, produced 15 kids; of these, 10 were normal; 5 (= 33.3 %) were abnormal.

4) 6 matings of father and daughter, in the case of 6 goats, resulted in 7 kids; of these 2 were normal and 5 (=71.0 %) were abnormal.

5) 5 matings between twins, in the case of 3 goats, gave 6 kids. Of these, 1 was normal and 5 (=83.3 %) were abnormal.

6) 2 matings between half brothers and sisters, with 2 goats, produced 5 kids; of these 2 were normal, and 3 (= 60 %) were abnormal.

Illustrations are given of the especially interesting breeding products. It is important to mention, that the experiments were divided into two series; in the first, those kids which were the result of mating near relatives, were generally defective, or even incapable of living; while in the second series, there were some excellent animals which had been bred in the same manner.

The ancestress of this second series was an "Erzgebirge" goat, perfect in all points. The writer maintains that, though in-breeding can have very bad results, as is shown in the first series of experiments, this is by no means always the case.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

1196 **Orders of the Board of Agriculture and Fisheries.** I Horses (Importation and Transit) Order of 1912. II Animals (Transit and General) Order of 1912 (1). London, 22nd April 1912.

The English *Board of Agriculture and Fisheries* issued on April 22, 1912 new Orders on the importation of horses, mules and asses, as well as upon their carriage by water and by railway.

Great Britain

I. According to the *Horses Order of 1912*, which will come into operation on the first of January 1913, no horse, mule or ass shall be landed in Great Britain otherwise than under the authority of a licence granted by the Board, or by a written authorisation by an officer of Customs and Excise, and at a port which has been authorised by order of the Board as a port for landing such animals.

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(1) For the Orders of the German Governement on this subject see *B.* June 1912, No. 935. (*Ed.*).

A licence granted by the Board shall not be available for landing a horse, mule or ass unless the animal is accompanied by a certificate of a veterinary surgeon to the effect that the animal on embarcation or while on board the vessel did not show symptoms of disease.

If a horse, mule or ass be landed without a licence granted by the Board, but only with the authorisation of a Customs officer, the animal shall on landing be moved direct to a place of detention provided by the Local Authority and kept there until released by a permit granted by an Inspector of the Local Authority after it has been examined (mallein test included) by a Veterinary Inspector and found to be free from disease.

The place of detention shall be thoroughly cleansed and disinfected before it is again used for the reception of a horse, ass or mule.

II. The *Horses Order of 1912*, chap. II-IV, deals with the carriage of horses, asses and mules by water and by railway; the *Animals Order of 1912* treats of the carriage of ruminants and pigs, and contains also regulations on the disinfection of means of transport, etc.

These regulations (with a few exceptions) came into force on the 1st of July 1912 and as, in the main, they are the same for horses, mules, asses, ruminants and pigs, the chief provisions are here grouped together.

No animal shall be embarked or carried by railway, if owing to infirmity, illness, fatigue etc. it cannot be carried without unnecessary suffering during the intended passage or transit. No cow shall be embarked or carried by railway, if the calving of the cow is probable during the journey.

Each horse, ass or mule shall be carried on board ship in a separate box or stall, except that brood mares, horses in charge of special attendants, and some other classes specified, may be carried in pens.

Ruminating animals and swine shall be carried in pens unless they are confined in a suitable crate, box or other receptacle.

The boxes and pens shall be of sufficient size and strength and their floors shall, in order to prevent slipping, be fitted with suitable battens or other footholds and be strewn with a proper quantity of sand or other suitable substance.

Every part of the vessel where animals are penned shall be provided with passage ways; overcrowding is forbidden and due care is to be given to sufficient and suitable ventilation and to the proper lighting of the parts of the vessel in which the animals are penned. Horses, asses and mules carried on a vessel for a voyage exceeding six hours, and other animals twelve hours, shall be provided with food and water. For the proper attendance of the animals the vessel shall carry a sufficient number of qualified attendants. Animals which on a sea voyage should get seriously injured are to be forthwith slaughtered. Between the 1st of November and the 30th of April shorn sheep shall not be carried on deck, except when they were last shorn more than sixty days before being shipped. At every place where animals are put on board or landed from vessels, water shall be supplied gratuitously to any animal at the request of any person having charge of the animal. Food also shall be supplied at such price as the Board approves. For the carriage of animals across an arm of the sea, or on a river or other inland water the provisions are not so strict.

In carriage by railway, the trucks shall be provided at each end with spring buffers and the floor, in order to prevent slipping, shall be fitted with battens or other proper footholds. The interior of the trucks shall be free from boltheads, angles or other projections likely to cause suffering to the animals carried. They shall further be so constructed as to admit of ventilation.

All parts of a vessel with which any animal or its droppings have come in contact, all fittings, pens hurdles or utensils used, for or about the animals, and in shipping or landing them, as well as the railway trucks, horse-boxes etc., shall be each time thoroughly swept, scraped, scoured and disinfected by a coating of lime-wash. In certain cases disinfections with chloride of lime, carbolic acid and other disinfectants are prescribed.

CATTLE.

1196 Schuppli, P. **Resumé of Weights and Measurements of the Cattle of the "Grabnerhof Alpine Farming School.„ Austria**. (Tabellarische Zusammenfassung der Wägungen und Messungen von Rindern auf dem " Grabnerhof „). — *Jahresberichte der steiermärkischen landwirtsch. Landes-Lehranstalten für 1911*, pp. 143-147. Graz, 1912.

From 1st March 1897 to 31st December, 1911 the Author weighed and measured regularly the cattle of the Grabnerhof alpine farming school in Styria. The results of this work are collected in the following tables:

Austria

	Age (years)	At birth		½		1		1 ½		2		2 ½		3		3 ½		4		4 ½		5 years	
		Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms	Number of animals	Kilograms
Average weight in kilograms	*Murboden Breed*																						
	Females	*139*	41	*131*	169	*127*	245	*121*	318	*114*	392	*106*	459	*89*	504	*72*	532	*62*	556	*53*	578	*43*	612
	Males (Bulls).	*63*	42	*49*	221	*43*	341	*19*	450	*10*	586	*7*	675	*5*	809	*3*	867	*1*	931	—	—	—	—
	» (Steers)	*20*	39	*17*	168	*17*	251	*18*	334	*14*	428	*12*	491	*12*	549	*9*	604	*9*	631	*5*	664	*3*	727
	Pinzgau Breed																						
	Females	*96*	42	*96*	175	*94*	256	*87*	323	*82*	403	*79*	463	*70*	513	*62*	538	*50*	570	*40*	565	*27*	609
	Males (Bulls)	*48*	45	*46*	241	*39*	354	*28*	435	*8*	556	*5*	685	*4*	756	*1*	721	—	—	—	—	*1*	927
	» (Steers)	*29*	40	*28*	168	*20*	249	*19*	334	*16*	439	*12*	537	*9*	583	*5*	653	*1*	635	*1*	661	*1*	698
Average height at withers in centimetres	*Murboden Breed*				cm.		cm.		cm.		cm.		cm.		cm.		cm.		cm.		cm.		cm.
	Females	—	—	*124*	104	*127*	116	*121*	123	*114*	128	*106*	132	*89*	134	*72*	136	*60*	137	*53*	138	*43*	137
	Males (Bulls).	—	—	*50*	109	*43*	122	*19*	130	*10*	138	*6*	142	*4*	148	*3*	152	*1*	153	—	—	—	—
	» (Steers)	—	—	*17*	104	*17*	118	*18*	126	*14*	134	*12*	140	*12*	144	*9*	148	*9*	150	*6*	152	*3*	157
	Pinzgau Breed																						
	Females	—	—	*96*	102	*94*	113	*86*	122	*82*	126	*78*	129	*70*	132	*61*	134	*49*	134	*40*	134	*27*	134
	Males (Bulls).	—	—	*46*	108	*40*	120	*26*	126	*9*	132	*5*	137	*4*	139	*1*	138	—	—	—	—	—	—
	» (Steers)	—	—	*28*	101	*20*	113	*19*	122	*18*	130	*12*	136	*9*	141	*5*	145	*1*	141	*1*	143	*1*	145

	Age (years)	½		1		1 ½		2		2 ½		3		3 ½		4		4 ½		5 years	
		Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres
Average girth in centimetres	*Murboden Breed*																				
	Females	*124*	121	*127*	140	*121*	155	*114*	168	*106*	177	*89*	181	*72*	186	*60*	189	*53*	191	*43*	193
	Males (Bulls)	*50*	130	*43*	155	*19*	170	*10*	186	*6*	199	*4*	210	*3*	218	*1*	219	—	—	—	—
	» (Steers)	*17*	122	*18*	142	*18*	158	*14*	172	*12*	182	*12*	190	*9*	195	*9*	199	*6*	204	*3*	210
	Pinzgau Breed																				
	Females	*96*	122	*94*	141	*86*	154	*82*	168	*78*	175	*70*	180	*61*	184	*49*	187	*40*	187	*27*	189
	Males (Bulls)	*46*	134	*40*	156	*26*	168	*9*	184	*5*	200	*4*	205	*1*	203	—	—	—	—	—	—
	» (Steers)	*28*	120	*20*	139	*19*	155	*18*	171	*12*	184	*9*	190	*5*	195	*1*	195	*1*	198	*1*	198
Average depth of chest in centimetres	*Murboden Breed*																				
	Females	*114*	46	*115*	54	*105*	59	*102*	63	*97*	67	*79*	69	*65*	70	*57*	71	*51*	72	*43*	73
	Males (Bulls)	*47*	49	*41*	59	*18*	65	*10*	70	*6*	74	*4*	77	*3*	81	*1*	80	—	—	—	—
	» (Steers)	*16*	47	*16*	55	*17*	61	*14*	66	*11*	69	*11*	73	*8*	74	*7*	76	*6*	77	*3*	79
	Pinzgau Breed																				
	Females	*79*	46	*79*	53	*76*	59	*71*	63	*69*	66	*64*	68	*56*	69	*44*	71	*40*	71	*27*	72
	Males (Bulls)	*42*	50	*35*	59	*25*	64	*6*	69	*5*	74	*4*	76	*1*	77	—	—	—	—	—	—
	» (Steers)	*25*	46	*19*	54	*18*	60	*18*	65	*12*	69	*9*	72	*5*	75	*1*	72	*1*	74	*1*	75

	Age (years)	½		1		1 ½		2		2 ½		3		3 ½		4		4 ½		5 years	
		Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres
Average breadth of chest in centimetres	*Murboden Breed*																				
	Females	53	30	56	34	58	36	59	39	54	42	49	45	38	46	38	46	38	48	27	49
	Males (Bul's)	26	33	24	39	7	43	4	51	2	54	1	60	1	60	1	62	—	—	—	—
	» (Steers)	7	30	6	34	8	38	9	41	8	44	8	44	6	46	6	47	4	49	1	48
	Pinzgau Breed																				
	Females	31	29	30	31	30	37	36	40	35	43	34	44	31	46	25	47	21	47	13	49
	Males (Bulls)	13	34	11	39	3	45	3	48	2	51	1	53	1	54	—	—	—	—	—	—
	» (Steers)	17	30	14	34	12	38	12	42	6	45	4	48	3	49	—	—	—	—	—	—
Average breadth across hips in centimetres	*Murboden Breed*																				
	Females	53	32	56	37	58	40	59	43	54	45	49	48	38	48	38	49	38	50	27	50
	Males (Bulls)	26	35	24	41	7	45	4	50	2	53	1	56	1	57	1	58	—	—	—	—
	» (Steers)	7	33	6	38	8	41	9	45	8	47	8	48	6	50	6	51	4	51	1	53
	Pinzgau Breed																				
	Females	31	32	30	37	30	40	36	44	35	46	34	47	31	48	25	49	21	49	13	50
	Males (Bulls)	13	35	11	40	3	45	3	48	2	50	1	50	1	50	—	—	—	—	—	—
	» (Steers)	17	33	14	36	12	40	12	44	6	47	4	50	3	52	—	—	—	—	—	—

	Age (years)	½		1		1 ½		2		2 ½		3		3 ½		4		4 ½		5 years	
		Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres	Number of animals	centimetres
Average length in centimetres	*Murboden Breed*																				
	Females	*105*	107	*105*	123	*102*	133	*96*	142	*93*	150	*78*	154	*64*	158	*57*	160	*50*	162	*43*	163
	Males (Bulls)	*41*	113	*37*	133	*15*	147	*8*	162	*6*	170	*4*	179	*3*	188	*1*	191	—	—	—	—
	» (Steers)	*15*	107	*15*	124	*17*	137	*12*	147	*9*	155	*10*	161	*7*	165	*6*	170	*6*	173	*3*	180
	Pinzgau Breed																				
	Females	*65*	109	*58*	124	*62*	184	*57*	143	*55*	149	*49*	156	*49*	157	*38*	160	*35*	160	*25*	161
	Males (Bulls)	*26*	116	*27*	135	*14*	144	*5*	153	*4*	170	*1*	170	*1*	172	—	—	—	—	—	—
	» (Steers)	*24*	106	*15*	119	*16*	132	*14*	144	*9*	154	*8*	161	*4*	168	*1*	166	*1*	170	*1*	170

. *B.* — The animals were mea a

1. *Height of withers* = The ve

2. *Depth of chest* = Vertical he
ior angle of the shoulder blad

3. *Breadth across hips* = Horiz

4. *Length* = Horizontal distan ity
ıe hip at the other.

ιe: *Musterungsbuch für Viehz* 10
Graz 1906).

SHEEP.

GROSS. **Sheep Breeding in East Friesland.** (Der Schafzuchtbetrieb in Ostfriesland). — *Illustrierte landwirtschaftliche Zeitung*, 32. Jahrgang, No. 49, pp. 457-459. Berlin, 19. Juni 1912. **1197**

Germany

In East Friesland, the " East Frisian Milk-Sheep " is almost the only breed kept. Typical animals of this breed are pure white and hornless. They are somewhat Roman-nosed, the head is not covered with wool, but with fine short hair, which allows the pink colour of the skin to be seen through it. The ears are broad and long. The feet and tail are also covered with fine short hair; while the rest of the body is covered with wool. The ewes have a well-developed udder.

Although lately the number of these animals, like that of all other sheep in Germany, has been decreasing, the Milk-Sheep is an important domestic animal on the coast of the North Sea.

They give 90 to 155 gallons of milk a year, with an average fat-content of 5 %, which, however, can rise to 10 % and over. The milk has a pleasant taste and is much liked in tea and coffee.

These sheep often take the place of goats.

Their wool is not very fine; but it is strong and contains little yolk; and is chiefly used in the manufacture of woollen underclothing.

The animals are very productive; as a rule the ewes drop twins, and three lambs are commoner than one. Their early maturity is another good quality. The lambs at birth weigh 7 3/4 to 13 1/4 lbs. and develop with such rapidity that they can always be used for breeding in the autumn of the same year. The rams weigh about 275 lbs. and the ewes from 130 to 200 lbs.

The Association for the Breeding of East Frisian Milk-Sheep (Ostfriesische Milchschafzuchtverein) has made the breeding of pure Milk-Sheep its aim. Every spring it holds markets for lambs for breeding purposes, and in the autumn arranges sheep-shows. In the interval, selection is made of the animals to be entered in the flock-book. Of late years, some new Societies have been formed for the breeding of Milk-Sheep; and since 1901, the selection of of breeding rams is insisted upon by the Government.

PIGS.

1198 MACKENZIE, K. J. J. and MARSHALL, F. H. A. **On Ovariotomy in Sows, with Observations on the Mammary Glands and the Internal Genital Organs.** — *The Journal of Agricultural Science,* Vol. IV, Part 4, pp. 410-420. Cambridge, June 1912.

Great Britain: England

I. With the onset of puberty there is in female mammals a distinct growth of gland tissue accompanied by an increase of ducts. Also there is frequently a swelling of the mammary glands in animals in heat. There is therefore a certain correlation between these glands and the primary sexual organs. Ribbert and Pfister have discovered, by the transplanting of the mammary glands in rodents, that such a correlation continues even when these glands of the animals experimented upon were not placed in their natural places but grafted in abnormal positions. It can thus not be a case of nervous functional correlation, but of the chemical effect upon the mammary glands of a secretion of the primary sexual organs.

Other investigators have been able to affect the activity of the mammary glands by means of injections of foetal extract, ovarian extract, or *corpus luteum* extract.

The experiments of the writers were made upon swine. In two sows killed shortly before or during ovulation the mammary tissue showed some indications of increased vascularisation. Of 8 Middle White sows, 4 were spayed when young, while the 4 others were not operated, but were not allowed to breed. The animals were kept under identical conditions..

The sows were killed when fully grown and those from which the ovaries had been removed showed no trace of the development of mammary glands, while in the 4 others the latter were well developed, and in one there was a secretion of milky fluid.

Another Middle White sow, which was killed when in heat, showed pronounced congestion of the mammary glands, the blood-vessels appearing to be both larger and more numerous than at other times.

In view of these observations, it is clear that there is a close correlation between the ovaries and the mammary glands, and further there is evidence that the mammary glands undergo cyclical changes corresponding with those which take place in the internal generative organs during the oestrous cycle.

In the case of swine, the matter becomes one of economic importance, for there is a very great prejudice against using the flesh of animals that at time of slaughter have been in heat, or which show signs of coming on or giving off of heat. The flesh of such animals is said not only to be very difficult to cure but also to have an inferior taste. One large firm, which finds it impracticable to allow sows showing signs of heat to be kept back till all signs of this condition disappear, has an expert examiner, who, by means of an incision in the abdominal region of the slaughtered animals, is able to pick out all the carcasses of animals killed during heat. If the animals are in this condition when killed, the two "sides" which contain the mammary glands (belly-piece) cannot be sold as first-class bacon, and this meat loses 70 % in value. Further, the value of the rest of the meat is decreased, the whole loss on every sow killed in heat being about 7*s.*

II. The course of ovulation has been observed by the slaughtering of many pigs while in heat and by the investigation of the ovaries.

Two Large Black sows showed congestion of the uterus, but the Graaffian follicles were not yet ruptured. The same was found in the case of a pig killed 5 days after the first signs of heat were noted. But in a Middle White sow, killed a week after pro-oestrum ovulation had taken place there were numerous developing *corpora lutea.* In another case, newly ruptured follicles were found in a pig killed during heat.

Since ovulation, according to these observations, first takes place at an advanced stage of heat, mating at this time is most likely to be successful. This agrees with practical experience. The practice of many breeders to keep the boar and sows together in a yard, in order to secure the pregnancy of the latter, is not to be recommended. The boar, when first turned in among the herd, will serve the sows first coming into heat several times; and his powers will be wasted by an excessive number of matings, many of which will take place in the comparatively early stages of heat.

III. As the butchers often believe that the black pigment in the mammary tissue of black pigs only occurs during heat and is derived from extravasated blood, experiments have been made on this subject. Black pigment was found in the mammary tissue of a young large Black pig and in another of the same breed in which the Graaffian follicles were only just beginning to ripen, and in a black pig which had been spayed. These three animals had none of them experienced heat. In addition to these sows, pigment in greater or less quantity was observed in the mammary region in five others and also in a small quantity in a hog. Chemical investigation (with Prussian Blue) shows that this pigment contains no iron, and differs in this respect from the black pigment which appears in the uterine mucous membrane of sheep at the end of the sexual season.

In twelve white pigs and in one black the mammary gland tissue was free from pigment.

IV. In discussing the question of the operation of spaying sows, the writers refer to a passage in the *Historia animalium* of Aristotle (written about 340 B. C.) which shows that it was customary already at that date. The practice is referred to in *Annals of agriculture* (1786). Although the butchers suffer loss when swine are slaughtered during heat and pig feeders are of opinion that spayed animals fatten more easily, operating is not so general as it was. The reason for this is that pigs are now killed at a very early age and that spaying is always attended with some risk.

Practical Conclusions.

1. Distinct changes take place in the tissues of the mammary region in sows during the period of heat. These changes consist mainly of congestion of the glands. Moreover, the part affected is in the pig of much commercial value.

2. The black pigment often found in the mammary tissue of black sows is not associated with the recurrence of heat, and cannot thus serve as a guide to the bacon manufacturer as to whether the sows have been killed when in that condition.

3. Since ovulation occurs during oestrus, and not during proœstrum, it is advisable to mate the sow towards the end of its heat period.

POULTRY.

1199 CADMAN, W. H. **Poultry Keeping in Egypt.** — *The Agricultural Journal of Egypt,* Vol. I, Part II, pp. 66-80. Cairo, 1912.

Throughout Egypt the average native fowl is a small, hardy and active bird. The hens are fairly prolific layers, but the eggs are very small. The quality of the flesh leaves much to be desired.

Egypt

Though the exportation of eggs from Egypt has increased of late (exportation in 1906 : 62 483 000 eggs ; in 1910 : 83 608 000), a good deal yet remains to be done for the development of the poultry industry. In Egypt, fowls are managed by the women ; on market days they take their eggs to market, where they are bought by egg dealers who send them to Cairo or to Alexandria for export. This system of marketing is slow and detrimental to the quality of the eggs. The sale of eggs on the cooperative system would be greatly preferable and the author recommends the adoption of this system.

The first Egyptian Poultry Organisation Society was started in Alexandria in the beginning of this year. Its object is to organize and develop the poultry industry of the country, and it possesses already some 70 modern hot-air incubators at work. At present selected eggs are being hatched, and the day-old chicks distributed, the best strains being reserved and reared for experimental purposes.

The art of hatching fowls' eggs by artificial heat has been practised by the natives from very remote times, and the non-sitting instinct of Egyptian poultry is attributed to this old practice of artificial incubation.

In the country there are at present 512 establishments for the artificial hatching of fowls' eggs according to the native system. The annexed figure shows the plan of a typical Egyptian incubator, and the section of one of the ovens. The ovens *A A* are situated in two parallel rows, divided by a vaulted passage which contains the chambers *B B* for the newly hatched chicks. A number of small openings for light and ventilation exist along the vaulted passage.

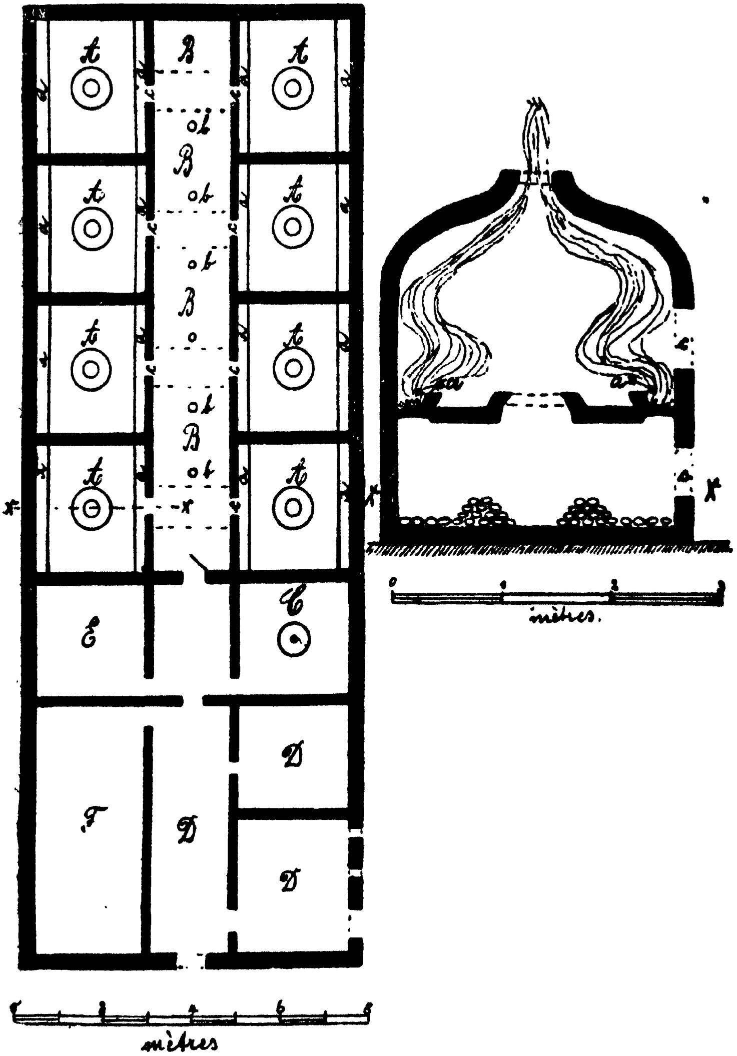
Generally the incubator proper is completed by other rooms in some of which (*D D*) the attendants live, while others are store rooms for the eggs (*E*) for the fuel (*F*) etc.; one room (*C*) is the ignition room.

The whole building is generally constructed of sun-dried Nile mud bricks.

Each oven contains two cells or compartments communicating by an opening in the middle of the lower roof. There is also a dome shaped opening in the upper roof for the escape of smoke. Round the sides of the floor of the upper cell, are narrow troughs (*a a*) with thin sheet iron bottoms in which the fuel is put. Each cell can be entered from the passage by an opening (*c c*) just large enough for a man to enter to place the eggs or fuel.

The ovens are heated a few days before putting in the eggs by burning bean straw or dung cakes on the floor. When a sufficient number of eggs have been collected from the women of the neighbourhood the fires are removed from the cells and the temperature regulated to the required degree. The eggs are then placed on the floors of the lower cells (see fig). The temperature is maintained at about 103° F. by adding glowing fuel from time to time to the troughs in the upper compartments. Thermometers are not used; the manager usually puts an egg against the sensitive skin of his eyelid and feels the degree of heat, long experience having enabled him to know the exact temperature necessary for the success of the operation.

The eggs are moved twice a day; after seven days they are



A typical Egyptian incubator.

tested by holding each egg in front of a candle or lamp. The unfertile ones are removed and sold. On the eleventh day the fires in the upper compartments are put out and about two days later some of the eggs from below are transported to the upper cells. Generally half the ovens are heated during the first ten days, the other half being filled with eggs when the fires no longer require attention in the first half.

The newly-hatched chicks are removed to the passage and are usually disposed of the following day, no food being required.

The incubators work four or five months. Assuming that each of the 512 incubators works four months, using, on an average, ten ovens, and that each oven holds 6000 eggs, it follows that about 185 million eggs are put in these incubators yearly. The fact that only about one third of the eggs fails, indicates the high standard of perfection obtained in the practical working of these incubators.

No better results could be hoped for by the introduction of the more complicated European incubators. The actual system might perhaps be somewhat improved by the introduction of thermometers and a few other improvements; but for the development of the poultry industry it would be much more important to spread proper instruction among the natives, who think that any egg which is fertilized is good enough to produce a chicken, and who often retain the best and biggest eggs to be sold to Europeans.

Winter Egg Records. — *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Twelfth Year, Vol. XII, No. 3, pp. 571-577. Dublin, 1912. **1200**

United Kingdom: Ireland

During the winter months (Oct. 1 to March 31) of the last four years, egg-laying competitions have been held in Ireland.

The following are the results:

Breed	Average number of eggs per hen.			
—	winter 1908/09	winter 1909/10	winter 1910/11	winter 1911/12
White Leghorn	44.3	39.7	41.5	45.1
Brown Leghorn (1)	40.7	42,1	37.9	49.3
Minorca	32.8	38.0	48.3	48.3
Buff Orpington	54.5	42.4	45.2	42.6
White Orpington	50.7	48.7	54.1	52.6
White Wyandotte	56.6	34.2	45.2	45.8
Faverolle	42.5	41.5	35.7	28.8
Plymouth Rock	35.9	39.2	45.5	36.5
Ancona (1)	—	—	—	64.9
Houdan (1)	59.2	58.5	62.5	58.0
Sussex	31.6	32.1	39.8	41.8
Andalusian (1)	—	71.3	—	—
Rhode Island Red (1)	—	—	63.9	61.9
Mixed pure breeds (1)	39.7	—	—	—
Mixed flocks	40.8	41.9	40.5	41.6

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(1) Results from less than 100 hens.

The method of feeding and treating the fowls is not mentioned.

The total number of hens, during the winter 1911-12, was upwards of 5 099; the numbers in the preceding years are not given, but there were only six breeds represented by less than 100 individuals.

It is important to note the great differences in the laying properties of different strains of the same breed during the same winter 1911-1912.

Breed	Average number of eggs per hen.		
—	Average of all the groups	Average of best group	Average of worst group
White Leghorn	45.1	70.4	25.5
Minorca	48.3	143.7	27.4
Buff Orpington	42.6	71.5	29.5
White Orpington	52.6	95.7	29.3
White Wyandotte	45.8	107.3	18.9
Faverolle	28.8	44.6	14.3
Plymouth Rock	36.5	59.8	18.2
Sussex	41.8	55.1	23.2
Mixed flocks	41.6	115.7	16.4

1201 **General Report — Queensland Agricultural College Egg-Laying Competition, 1911-1912** (1). — *Queensland Agricultural Journal*, Vol. XXVIII, Part 5, pp. 322-324. Brisbane, May 1912.

In the eighth egg-laying competition held at the Queensland Agricultural College from 1st April 1911 to 31st March 1912, there were 24 pens each of 6 hens.

These were made up as follows:

White Leghorns	18 pens.
Brown Leghorns	2 pens.
Silver Laced Wyandottes	1 pen.
White Plymouth Rocks	3 pens.

Australia: Queensland

The morning meal of the hens (at 6.30 a.m.) consisted of bran and pollard (equal parts), with 1 ½ lb. Sunlight oilcake or 1 quart of desiccated meat on alternate days, mixed into a crumbly mass with hot water in winter and cold in summer. The birds were fed as much as they would eat up eagerly. At midday they were given chaffed green lucerne and a little soup meat when available. The evening meal (at 5 p.m.) consisted mostly of wheat, with an occasional feed of oats or maize.

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(1) See also *B.* July 1912, No. 1069. *(Ed.)*.

The weather was not very favourable: there were long spells of drought, and during December great heat caused a considerable falling-off in laying.

The total number of eggs laid during the twelve months was 28 055, an average per hen of 194.8 and per pen of 1 169. Of the individual pens the following may be selected:

White Leghorns, largest number	1 391	eggs
» » smallest »	1 018	»
Brown Leghorns, 1	1 310	»
» » 2	984	»
Silver Laced Wyandottes	1 153	»
White Plymouth Rocks, largest number	769	»
» » » smallest »	631	»

BEES.

1208

WHITE, G. F. **The Cause of European Foul Brood.** — *U. S. Department of Agriculture, Bureau of Entomology, Circular* 157, 15 pp., 10 figs. Washington, May 10, 1912.

United States

The writer, after having studied the causes of European Foul Brood, obtained the following data.

1) *Bacillus alvei*, which has been so generally spoken of as the cause of foul brood, is probably not concerned in the etiology of the disease. It was isolated from diseased brood, and pure cultures of the organism, in both the vegetative and spore forms, were repeatedly fed to colonies of healthy bees, with the result that foul brood was not produced in any instance.

2) By a study of many larvae in samples of European foul brood, it was frequently found that there were larvae, apparently dead of the disease, that contained *Bacillus alvei* only in small numbers, or not at all. This increased the suspicion that *Bacillus alvei* was not the exciting cause of the disorder.

3) In 1907, the writer proved that by feeding pure cultures of *Bacillus larvae* to healthy bees, American foul brood could be produced.

4) By feeding diseased larvae to healthy colonies, it was found that European foul brood could be artificially produced.

5) The sick larvae of the disease artificially produced were frequently found to be free from *Bacillus alvei*.

6) *Bacillus alvei* in this way was tentatively eliminated from the list of possible exciting causes of European foul brood. In a

quite similar manner, the other bacteria, *Streptococcus Apis*, *Bacillus mesentericus vulgaris*, *Bacillus Orpheus* and *Bacterium Eurydice* were likewise eliminated from the list.

7) Considerable quantities of filtrate from aqueous suspensions of crushed diseased larvae were fed to healthy colonies, and in no instance was European foul brood produced. This eliminated tentatively the probability of there being an ultra-microscopic virus in European foul brood capable of producing the disease.

8) *Bacillus Pluton*, therefore, was the only factor that was not so eliminated from the list of possible exciting causes of the disease and was therefore the probable cause of European foul brood.

9) When this organism was studied in larvae in which the disease could be suspected by inspection alone, one or more species of bacteria were sometimes found to be present also. These, when present, however, occurred in relatively small numbers.

10) The disease was then studied in a still earlier stage, *viz.* before its presence could be detected by gross examination of the larvae. This study demonstrated that in the production of the disease *Bacillus Pluton* was the first invader of the healthy larvae.

It will be noticed, therefore, that in the determination of the primary exciting cause of European foul brood two objects were accomplished: All the factors in the list of possible exciting causes of the disease were eliminated, except the one organism *Bacillus Pluton;* by the study of infected larvae soon after the infection took place, this parasite was found to be the first invader.

Therefore, it is the belief of the writer that sufficient evidence has now been obtained to justify the statement that *Bacillus Pluton* is the primary exciting cause of a brood disease. There are then, three principal brood diseases. Two of these — American foul brood caused by *Bacillus larvae*, and European foul brood caused by *Bacillus Pluton* — are known to be infectious. From these two diseases there must be differentiated the third one, an apparently non-infections disorder, the so-colled " pickled brood." Larvae dead of this latter disease are practically free from microorganisms. The exciting cause of this disorder is not yet known.

1208 Bryan, A. Hugh. **Chemical Analysis and Composition of Imported Honey from Cuba, Mexico, and Haiti.** — *U. S. Department of Agriculture, Bureau of Chemistry. Bulletin* No. 15, pp. 7-17. Washington, April 29, 1912.

United States The results of the writer's investigation seem to show that there is no pronounced difference between honey from North America and that from Cuba, Mexico and Haiti. The latter is, however, slightly richer in water, and poorer in sugars. There is also little difference between the honeys from Cuba, Mexico and Haiti, though the latter resembles American honey more than do the Mexican and Cuban products, having a sweeter and more agreeable taste and being generally lighter in colour.

But there is another important question with regard to the importation of these honeys into the United States, to which Mr. E. F. Phillips of the Bureau of Entomology draws attention: American foul brood is known to be prevalent in Cuba, and outbreaks of this disease have been traced to shipments of Cuban honey. Further, the preparation of the honey for shipment leaves much to be desired. The extraction is carelessly carried out and much dirt was present in the samples received. This comes from the fact that modern methods of bee-keeping are not employed in these countries. The honey is mostly wild, or that from wild bees, and is collected by the natives in a primitive manner. Again, with few exceptions, the flavour was rank and strong, so that it could hardly be considered palatable. Considering the physical condition of the samples received, it can be said that in nearly all cases, they were unfit for human consumption. Re-extraction, straining, etc., might improve this condition; but it is a question whether, even by this treatment, the honey could be made fit for table use, as the dirt has become too intimately mixed to be removed by physical means.

SILKWORMS.

BALERIOLA, GASPAR. **Encouragement of Silkworm Rearing and of the Silk Industry at Valencia.** (El fomento de la sericicoltura y de la industria sedera valenciana). — *La Información agricola*, Año II, No. 13, pp. 243-244. Madrid, Junio de 1912. **1204**

Under the title of "El fomento de la sericicoltura y de la industria sedera valenciana" a private institution has been founded at Valencia, which proposes to stimulate and further the development of silkworm rearing and of the silk industry in the province of Valencia. Its programme includes: free distribution of mulberry trees; improvement in the rearing of silkworms so as to obtain a yield of upwards of 151.8 lb. of cocoons per ounce of eggs; cultivation of the mulberry without irrigation, giving it the most advantageous form, and preferring plantations of mulberry hedges and espaliers; foundation of a silk cultivation station endowed with land and all necessary equipment, and of travelling lectureships on silk **Spain** production. At present " El fomento " has opened at Valencia a pavillon to which the public is admitted free, and in which small experimental and demonstration lots of silkworms are reared. The eggs are produced on Pasteur's cell system and their freedom from disease is guaranteed by the microscopical analysis of the moths.

1205 **Statistical Notes on Japanese Silk Production.** (Notizie statistiche sulla sericoltura giapponese). — *Ministero degli Affari esteri. Direzione generale degli affari commerciali. Rapporti dei RR. agenti diplomatici e consolari,* No. 10, pp. 7-10. Roma, giugno 1912.

Japan

In the following table the information supplied by the Italian embassy at Tokio is given :

	Establishments with reelers' trays (bacinelle) on the Italian system	Establishments with sedentary reeling (Zaguri)	Establishments with standing reeling (Ashibumi)	Establishments with reeling of double cocoons
Number of reeling establishments	2 385	399	281	165
Number of reelers' trays .	153 771	19 354	5 001	6 119
Number of workwomen .	159 460	19 882	5 515	5 945
Cocoons reeled (1908) bushels	9 053 896	329 215	120 832	337 011
Product from the reeling of raw silk (1908) lbs. . . .	13 990 123	486 745	218 037	439 591
Product of reeling per tray during the year (1908) .	85 lb. 15 oz.	48 lb. 15 oz.	47 lb. 10 oz.	83 lb. 5 oz.
Cost of producing 1 cwt. of raw silk	£9.7*s* 5 ½*d*	£6.19*s* 6 ½*d*	£7.7*s* 10$^{3}/_{4}$	£5.16*s* 7$^{3}/_{4}$*d*

The power which drives the 184 245 above mentioned reels consists of the following :

Steam	motors	1 552
Hydraulic	»	662
Electric	»	15
Gas	»	6
Hand	»	995
	Total	3 230

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS.

1206 NEHBEL, HARALD. **The Present Position of the Potato-Drying Industry.** (Der gegenwärtige Stand der Kartoffeltrocknungsindustrie) — *Fühlings Landwirtschaftliche Zeitung*, 61. Jahrgang, 10. Heft, pp. 357-361. Stuttgart, 15. Mai 1912.

In February of the current year an exhibition of drying apparatus for potatoes, etc., was held in Berlin on the initiative of the meeting of the Association of Spirit Manufacturers. This exhibition proved that the drying industry has already reached an exceedingly advanced stage, and that the appliances are hardly open to further improvement. **Germany**

The drying appliances may, according to their mode of operation, be divided into two classes:

1. Flake driers.
2. Slice driers.

In the flake appliances the potatoes are first steamed and then, after crushing, pass in a thin layer onto one or more hollow rollers in constant rotation and heated within. The layer of potato thus dries on the rollers. At a point near the roller jacket a scraper knife is fitted, so that it constantly scrapes off the dried potato substance in the shape of flakes from the rotating roller. The slice driers dry the potatoes raw after they have been cut into slices by a suitable machine.

The appliances of the *Trocknungs-Anlagen-Gesellschaft*, " Tätosin " system, and those of the firm of Sachsenburg Bros., each have two drying rollers parallel to each other, in slight contact and rotating counter to each other when the machine is at work. The hollow rollers are heated inside by steam. The steamed and crushed potato substance passes in the middle between two rollers and is distributed with uniform fineness over their surface by suitable contrivances. In this way it dries rapidly and is scraped off after lying on the surface of the roller until the latter has made about three quarters of a rotation, *i. e.* until the point in question has reached the scraper knife. The steam produced in the drying process is drawn off by an exhauster. The water forming inside the rollers by steam condensation is, in the design of the first named firm, removed by a bucket chain arrangement, and in that of the second firm by means of a stiffening spiral inside the roller. This spiral acts like a conveyer worm when the roller is rotated, and thus conveys the condensed water to an end of the roller where it can run off.

The firm of Paucksch has shifted the two drying rollers slightly apart, so that the surfaces are not so much exposed to damage by grains of sand passing between. Separate unheated smoothing rollers have also been provided in this case, being pressed against the main rollers by springs and uniformly distributing the potato substance over their surface.

In the Förster drier the main rollers are far enough away from each other to allow of fitting a separate iron rod between them to prevent stones getting between the rollers. The rollers turn outwards; special feed and smoothing rollers effect the supply and distribution of the steamed potatoes.

The firm of Venuleth and Ellenberger does not feed in the steamed potato substance from the top and middle, but effects feed separately to each roller from outside. Separate feeding and smoothing rollers are also used. The feeding rollers lie on the outer side in boxes with removable lids. Any stones among the potato substance remain in the boxes of the feed rollers.

The drier made by the *Deutsche Landwirtschafts-Industrie* has only one drying roller, to which the potato is conducted from above, and which has one unheated smoothing roller. The scraper knives can in this design be shifted quite close to the feeder, so that almost the entire surface of the roller is utilised for drying.

The drier manufactured by I. Aders has the potato fed in from below. It is also fitted with three small unheated feed rollers, and in addition a wooden roller for removing the skins from the potatoes. The steam need not be drawn off on this system, as it can escape upwards without hindrance.

A special position is occupied by the appliance made by Ed. Kletzsch. Its design is quite similar to that of the "Tätosin" apparatus, but the drying rollers are heated not by steam but by oil. The oil is raised to a temperature of 240° in a special heater, is then conveyed by a pump through a system of tubing into the drying rollers and flows from there back to the heater; it is therefore in constant circulation during work. This does not produce any pressure above atmospheric either in the piping or in the drying rollers, and the operation is entirely without danger. The oil used is a pure mineral oil free from resin and acid, with flaming point at about 350° C. The high temperature considerably increases the output; 180 lbs. of raw potatoes can be dried per hour on 1 square yard of roller surface. The rollers run at a speed which does not allow the flakes to get burnt.

Slice driers are built by a small number of firms. The appliance made by Messrs. Büttner consists mainly of a heating plant and a drying drum. The drum receives the slices to be dried. It is divided into chambers inside, and when it is rotated these chambers carry the potato slices up with them and then gradually allow them to drop. The slices are in this way in a constant circulation of hot air, which, mixed with heating gases, enters the drum at a temperature of 300-400° C.

G. Sauerbrey's machine has a drying drum with movable internal part, consisting of a shaft with wings or vanes mounted thereon. The inside shaft completes a rotation periodically and in this way each time forces the drying material a little way forward so that it gradually passes from one end of the drum to the other. The number of rotations can be regulated.

The uniform distribution of the heating gases in large drying drums involving difficulties, the machine-works of A. Wagner make a drier with 8 smaller drums; four of these form the first driers and four the final driers. A slicing machine slices up the necessary potatoes in the first driers, in which they pass from one drum to the other, being continually exposed to the action of the heating gases. A worm then conveys them into an elevator which carries them to the final driers. From these they pass into a cooling drum and can be immediately put into sacks. This machine is intended for operation on a large scale. For smaller operations, *i. e.* for an hourly use of 4 quintals (8 cwt.) of raw potatoes, the firm make a simplified machine with only 5 drums; the potato slices are thrown into the topmost drum by an elevator and pass through all 5 drums, dropping from each higher one into the next lower.

1807

RUEMKER, KURT VON. **Two new Sowing Apparatus for practical Plant-breeding, Gardening and Forestry, and for Scientific Experiments on Small Plots.** (Zwei neue Apparate für die Saat im Betriebe der praktischen Pflanzenzüchtung, Gärtnerei u. Forstwirtschaft, sowie für wissenschaftliche Versuche auf kleineren Freilandparzellen). — *Deutsche landwirtschaftliche Presse*, XXXIX Jahrgang, No. 44, p. 514. Berlin, 1. Juni 1912.

Germany

The Author, with the help of one of his assistants, constructed and tried both apparatus.

1. The hand drill (fig. 1) is worked by one man. A coulter is fixed in front of the seed funnel and a pressing roller behind it. The seed hopper can be tipped so as to free it rapidly from any seeds left in it. The amount of seed can be reduced to 17.84 lb. of wheat per acre and to 5.35 lb. of small seeds, without incurring

the risk of crushing or otherwise injuring any of the grains or affecting the uniformity of the seeding.

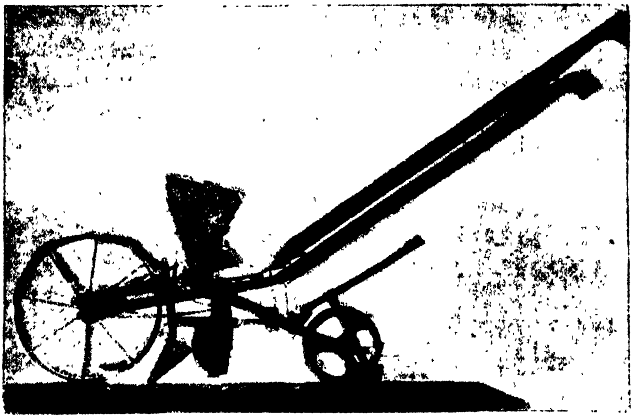

Fig. 1 — Hand Drill.

In the Breslau University experiment field in the spring of 1912, 130 plots of 107.6 sq. ft. each were drilled to wheat in 8 hours, and 210 plots of 161.5 sq. ft. were drilled to beets in 6 hours. The seed sprouted with a uniformity that had never been attained in sowing by hand.

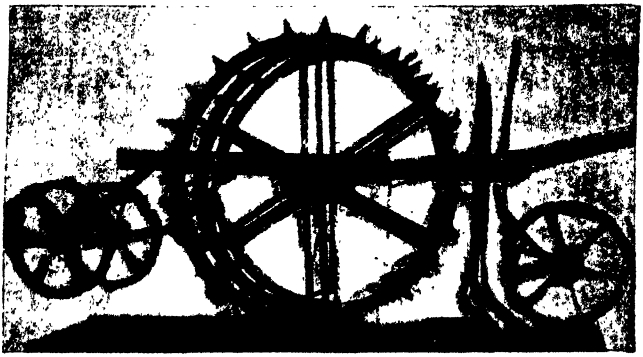

Fig. 2 — Marker.

2. The marker (fig. 2) is used for sowing single grains in rows. Three wheels about 3 ft. 3 in. in diameter are mounted on

an axle. On the tyres of the wheels small cones are fixed at equal distances from each other. The central wheel can be shifted on the axle in such a way that the holes that its cones make in the ground either form squares or triangles with those made by the cones of the side wheels. In front of each wheel a small share is fixed which removes the upper dry earth so that the holes are pressed in the moist earth. The marking wheels may be set high so that the apparatus rests on its road wheels; these can then be used as pressing rollers to roll the rows after the seeds have been laid.

During a trial made last autumn, three women in 9 hours laid 24 600 single grains in the holes made by the apparatus; the seeds sprouted with the greatest regularity.

RURAL ECONOMICS.

Prices of the principal Agricultural Products in Switzerland from 1870 to 1910. — *Rapport du Sécretariat suisse des paysans au Département fédéral de l'Agriculture sur les recherches rélatives à la rentabilité de l'agriculture pour la campagne 1910-1911.* Berne, 1912. **1208**

In the preceding number of this Bulletin the report of M. Laur, Director of the Swiss peasants' secretariat, on the profitableness agriculture during the year 1910-1911 was reviewed. As a complement to it, the average index numbers of the prices of the principal agricultural products during the period 1885 to 1910 are here given. **Switzerland**

These index numbers have been calculated on the basis of the prices of agricultural produce in the year 1900 assumed equal to 100.

Average of index numbers. Prices of 1900 = 100

	1870	1885-1888	1889-1891	1892-1905	1909	1910
	%	%	%	%	%	%
Cereals	175.83	111.25	112.94	104.86	115.90	108.66
Potatoes	—	—	—	126.85	146.33	174.98
Tobacco.	—	85.18	91.57	92.07	105.89	107.72
Wine	166.30	155.17	201.85	140.15	190.52	229.83
Fruit	—	160.07	184.66	212.15	212.16	206.17
Cider	—	—	—	154.73	167.66	181.00
Vegetables	—	111.81	101.63	103.87	174.73	203.88
Hay	107.80	117.73	89.83	109.45	113.50	113.00
Hemp and flax	—	94.25	99.09	99.68	101.67	106.72
Breeding cows	100.00	106.67	106.67	106.33	116.66	125.00
Milch cows.	—	—	—	101.37	122.61	130.83
Cows for the butcher.	—	89.34	89.06	103.60	125.97	129.60
Cows in calf	—	—	—	103.19	127.61	133.13
Draught oxen	—	—	—	105.94	126.59	128.24
Fat oxen per 100 lb. dead weight	—	92.63	98.62	109.30	125.20	129.26
Fat oxen per 100 lb. live weight.	—	108.56	102.78	107.94	128.94	132.87
Calves for breeding	—	—	—	96.71	126.79	131.68
Calves for the butcher	—	—	—	110.42	138.55	145.47
Fat calves per lb. live, 1st qual.	—	95.29	87.78	107.36	125.70	134.25
Fat calves per lb. live, 2nd qual.	—	—	—	110.04	130.57	135.00
Fat pigs per lb. of dead weight	—	—	—	104.48	120.34	132.78
Fat pigs per lb. of liveweight	113.35	92.45	103.38	106.96	117.85	126.74
Sheep per lb. of dead weight.	—	—	—	114.48	141.38	144.83
Meat	—	91.74	101.23	102.71	114.80	117.24
Eggs	82.39	82.39	86.17	93.84	119.24	121.59
Honey	—	97.50	103.00	101.00	90.00	110.00
Milk	—	88.53	102.77	102.93	131.49	140.00
Butter	83.70	81.68	98.10	97.29	111.47	120.12
Cheese	—	102.71	111.69	112.64	141.50	148.00

TAYLOR, H. C. **Methods Applicable to the Study of Economic Problems in Agriculture.** — *The University of Wisconsin Agricultural Experiment Station, Bulletin* No. 16. Madison, Wisconsin, 1912. [illegible]

United States: Wisconsin

The writer's purpose is to outline in this Bulletin some of the methods which have proved useful in gathering facts connected with the economic problems in Agriculture. These methods have been classified as: Historical, Geographical, Statistical, Accounting and Experimental.

In the study of economic forces much is gained by tracing their operations through a considerable period of time. Economic forces are not easily measured, and they are so numerous, of such varying strength, and so often operate in opposite directions that at any given moment it is difficult to make an estimate of the future resultant of these forces, unless the changes wrought by them in the past can be resorted to as a basis of judgment.

The first statistics of land tenure were collected in the United States in 1880, and at the present time, with the changes of thirty years recorded at ten year intervals, it is possible to demonstrate clearly the trend of affairs during that period and to describe many of the forces which have been operating. By comparing the data for the two periods 1890 and 1900 it becomes clear that some force is retarding the movement from tenancy to owership. The available materials also show that young men do very generally rise through the successive stages of tenant farmers and mortgaged owners to the free ownership of farms. Another example of the historical study of economic forces is afforded by the maps showing the changes in the sheep industry in the United States. Between 1840 and 1850 there was a decline in the number of sheep kept in parts of Vermont and in the eastern part of New-York, but the marked change was in Ohio and Michigan, where there was a great increase. The decade from 1860 to 1870 brought a reaction in north-eastern Ohio and the beginnings of the concentration of the sheep industry of Texas in the dry lands of the South. By 1880 Vermont had almost ceased to be a sheep state, and the sheep of New-York were but a small number, but the beginnings of the new industry in the Rocky Mountains states were already important in Colorado, Wyoming and Montana. Between 1890 and 1900 a marked decline is shown in California, Texas, Wisconsin, Michigan and Ohio, while the development of the sheep industry in the mountain states continued. To explain these changes it becomes necessary to write the history of the expansion of American agriculture. The competition of the various farm enterprises has played an important part. The result of this competition is determined by geographic factors. Topography, climate, and nearness to the market are important examples. In Vermont, New-York, northeastern Ohio and in Wisconsin, wool growing was driven out by the dairy industry. The economic principle involved is simple. The dairyman at a distance from the market for dairy products cannot compete with the one near the market so well as the shepherd in the distant hills and downs can compete with the wool grower near the centre of population. Beef cattle replaced sheep in Texas, the development of agriculture and fruit growing by irrigation was an important factor in California and tariff legislation played an important part in forcing out the sheep in Ohio and Michigan, during the nineties.

The study by the Geographical Method of the types of farming in the various regions of the United States shows a high degree of diversity. In one region, corn, oats, hay, pasture, dairy cows and hogs, constitute the principal enterprises combined upon the individual farm. In another region the combination is the same with the exception that more emphasis is given to corn and hogs, and beef cattle replace dairy cows. In other regions the live stock is unimportant and special crops as wheat, cotton, or cane, stand out as the dominant enterprise ; while in still other regions, the grazing of cattle or sheep becomes the principal enterprise. These variations in farm organization are due to differences in soil, climate, labor supply, market relations, etc. The explanation of differences in types of farming, so far as they are due to differencas in environment, is the purpose of the geographical method. Maps are given showing the distribution of spring wheat, barley, and oats. These crops are usually counted competing crops. They occupy the same place in the system of crop rotation and they would require the attention of the farmer about the same time of year in any given region. A study of the maps shows a remarkably distinct division of territory between these crops. That climate is one factor in determining this division of territory is obvious from the nature of the division. These crops differ in their demands for moisture as well as in their requirements with regard to temperature. Soil differences are said to play an important part in this division of territory. The relation of the barley regions to barley markets is in itself suggestive of another geographic factor which should be considered.

This study might be carried further by the use of charts of the various other enterprises which are complementary or supplementary to this group of competing crops. Such maps would show the spring wheat region to be a flax region and the oat regions to be corn regions, etc. This method followed out completely with maps of livestock as well as crops, would show the type of farming in any agricultural region. The maps showing the type of farming should be accompanied by maps showing the topography, the soil, the length of the growing season, the temperature during the growing season, the rainfall, the market, the agricultural population, the manufacturing population, the mining population, etc., all of which help to explain the types of farming in terms of geographical differences.

The statistical method stands for quantitative study. Much of our knowledge of economic forces corresponds to qualitative analysis in chemistry. The force is noted but not measured. The statistical and accounting methods look to the measurement of forces, thus putting the work on a quantitative basis. In the treatment of every subject and in the use of all other methods all data which lend themselves to counts or measurements should be treated statistically. There are specialists who devote themselves to the collection and the tabulation of statistics. Their finished product is the raw material for the agricultural economist. The reports of the Federal Census constitute a comprehensive source of material from which it is possible to ascertain the type of farming in every section of the United States, and it gives a basis for the study of comparative agriculture, which is one of the best methods of gaining knowledge of the economic forces which determine the actions of farmers. Two methods which the writer has found useful in the utilization of these statistics are illustrated in this Bulletin. The system of mapping, providing a chart with close graduation of variation in density for each fact presented in the census, puts the materials in form for ready comparisons both historical and geographical. Not only does the series of maps show the changes in the localization of each line of production through a series of years, and show how the territory is divided between the various lines of production at a given time, but it indicates also the way in which the different lines of production are combined in a given district, thus showing the type of farming in each district. The tabular method can also be used to advantage in comparing types of farming.

State census reports, the annual reports, and more recently the Year Books of the U. S. Department of Agriculture and the state agricultural reports contain valuable statistics. Market reports in trade papers and in reports of boards of trade, etc., provide statistics of use in the study of prices. But anything that the agricultural economist can do for himself in the collection and tabulation of statistics will be but a drop in the bucket in comparison with the data available in the sources which have been prepared by the statistician. Since he is so dependent upon these sources of material, it is important that the agricultural economist be in close touch with the agricultural statistician who is preparing these source books.

The accounting method enables the operator of a farm to know what to produce and how to produce it, in order to secure maximum profits from the business. The data secured by this method may have some general value, but its primary purpose is to give a basis for more intelligent direction of the operations of the farm, for which the accounts are kept. The one who plans the records and their tabulation must have a clear vision of economic forces if he would plan a successful system of accounts, for economic forces determine what should be done on the farm. The system of accounts must show quantitatively the workings of these forces at a given time and place.

In agricultural accounting, the first problem is to contrive a system of records which will show what to produce, and this problem is more complex in farming than in almost any other business. The problem of first importance in the organisatian of a farm for profits is that of correlating a group of enterprises upon one farm in such a manner as will keep the labor and equipments employed as nearly continuously as practical and in that enterprise which will yield the largest returns of all those which can be carried on at the given time of year.

It is obviously to the farmer's interest that he select from each group of competing crops the one which will add most to his net income. It is equally clear that he will desire to combine as many complementary enterprises as will add to the profitableness of the business as a whole. The problem the accountant has before him is the planning of such records as will show the way in which the various complementary enterprises fit together to fill out the year's employment, and such records as will enable him to show the relative profitableness of each of the competing enterprises. A labor record showing the exact distribution of all man and horse labor employed each day in the year gives the material for a chart which will show the time employed in each enterprise. The charts for the various enterprises on one farm will show the complementary character of certain crops, and the charts for a series of farms in the same locality on some of which the one, on some the other, of a group of competing crops are being grown, the competitive character of certain crops can be shown.

In studying the demands of the various crops upon the time of the farmer, operations should be divided into two classes: those which must be done within very narrow limits of time; and those which can be done equally well at any time through a period of considerable length, such as ploughing and threshing.

The next step in the study, is to compare the relative profitableness of the competing crops. The following table based upon records secured by the Wisconsin Experiment Station in co-operation with the United States Department of Agriculture illustrates methods of comparing relative profitableness.

Methods of Comparing Profits.

Crop	Profit per Acre $	Profit per hour of labour $
Barley	12.75	0.734
Oats	13.97	0.785
Wheat	19.72	0.969
Hay	14.16	1.868
Corn	6.82	0.371
Tobacco	18.59	0.093

No generalization can be drawn from this table as to which crops will, as a rule, be most profitable to the farmer, since the figures were elaborated on one single farm; but this table shows the importance of the method of comparing profits per hour of labor.

Taking profits per unit of labor as a starting point for the further considerations, the limitations and complexities involved in its use will be noted. Where two crops can be found which require the attention of the farmer at exactly the same time throughout all their operations and in forms of labor which require the same amount of managerial activity per unit of labor, the question of relative profitableness is easily worked out on the basis of profit per unit of labor; but where crops are competitive for a portion of the year and complementary for the remainder of the year the solution of the problem of relative profitableness is not so simple.

Another set of problems which the agricultural economist must consider relates to the proportion in which the factors of production should be combined. Some of the data essential to the analysis of these economic problems of the farm can be secured by keeping records upon farms under management of intelligent farmers with whom it is possible to cooperate.

The proper degree of intensity of culture must be determined for each farm and the result will change with variation in the wages of labor, the cost of equipment and the price of land. The first step toward progress in this line is the discovery of a method of experimentation which can be applied upon any farm without State aid and without endangering the profits of the farmer, In the theoretical analysis of this problem, the point has been reached where experiments are essential to further progress. Differences in the soil, in the value of the land, in the efficiency of the farmers, and in facilities for marketing, make different degrees of intensity of culture necessary; and a method including some process of gradual adjustment of the farm, planned in such a way as not to endanger the profits of the farmer, suggests itself as most likely to succeed.

The writer gives in appendix the chapter headings of a Course in Agricultural Economics, stating that the aim of the Bulletin was principally to describe the methods in use at the Wisconsin Experiment Station at the present time, in securing an intensive and a comprehensive view of the economic forces which affect the farmer.

1210 **The American Farm Management Association.** — *Reports of the First and Second Annual Meetings.*

United States

The first meeting of the American Farm Menagement Association was held at Ames, Iowa, in 1910.

At this meeting the committee on scope and cleavage presented the following report:

" The field covered by Farm Management is:

" 1. The organization of the farm, in which such questions as types of farming, equipment, labor, etc., are dealt with.

" 2. Farm operation, in which the various types of farming as they are conducted in the various regions where they occur, are dealt with.

" The general study of farm practice is an essential perquisite to the study of farm management questions.

" Farm management deals with the rural problem from the individual or private point of view. It differs from agricultural economics or rural economy and from rural sociology in that these subjects view the rural problem from the national or public point of view.

" In the study of systems of land tenure for instance, the student of farm management wants to know what the various systems are and the business results which are likely to accompany them. He is also interested in the effect they have on the fertility of the soil. On the other hand the student of rural economy is interested in land tenure in relation to the economic welfare of the people in general, while the rural sociologist is interested in its effect upon citizenship and the social status of the rural population.

" Relative to the value of land, the student of farm management is interested in the question from the standpoint of the cost of starting a farm ; the student of rural economy is interested in the causes which affect land values and in the effect that land values have on industrial affairs.

" Again, such subjects as Mutual Insurance Companies among farmers are plainly closely related to the business of the farm, but must be regarded merely as a small extension into the business of farm management of a very large subject which, on the whole, lies entirely outside of the realm of farm management. It would, therefore, seem expedient that it should be handled by the rural economist, although the teacher of farm management may point out the advantages to be gained by such an organization.

" Such subjects as farm plans and farm accounts lie wholly in the field of farm management, and farm equipment must also be included, although other scientists may have interest in this subject.

" Farm management, is interested in the subjects of agronomy, animal husbandry, dairying, horticulture, etc., in so far as they relate to the business management of the farm. The question of what varieties of field crops or other plants to grow, the kind and amount of cultivation needed, how to care for the seed, etc., are purely agronomical and horticultural problems. On the other hand the question of whether a farmer should grow corn, and how much to grow, and whether he shall sell it or feed it are farm management questions.

" Many scientific and practical questions in agronomy, animal husbandry, dairying, horticulture, etc., may be answered in part by the experience of farmers, and frequently their solution only awaits the collection of facts and their adequate interpretation.

" Since the farm management investigator devotes his time primarily to the collection of data existing on farms (his material exists there and nowhere else), and since he is trained in the interpretation of data which exist in farm environment, it is believed that the greatest efficiency will result to agricultural colleges by encouraging the farm management investigator to collect such data wherever he finds it in connection with his work and to make such reports of the same as will be mutually satisfactory to all departments concerned.

" It is believed therefore that the field-workers in farm management should be free to study farm practice in all its phases; furthermore it is believed that an enormous gain in efficiency of the investigations of the Association will be made by having management investigators work in the closest co-operation and harmony with the rural economist, the agronomist, the animal husbandman, the poultryman, the horticulturist, and all of the other investigators whose business relates directly to the farm ".

At the second meeting of the American Farm Management Association held at Columbus, Ohio, November 14th and 15th, 1911, the Committee on investigations presented a report in connection with the plan of work to be followed by the Association.

In order to ascertain the status of farm management investigations at the present time, and to draw out the conception held by investigators in the various States, of the term " farm management investigations ", an inquiry was made including practically all Experiment Stations and Colleges of Agriculture (about 50 institutions).

It was found that farm management investigations are separately recognized in about 30 institutions, being carried out: on a cost of production plan, in seven States: Colorado, Massachusetts, Missouri, New-York (Cornell), Ohio, Wisconsin, Minnesota; on a farm survey plan in five States: Massachusetts, New Hampshire, New-York (Cornell), Ohio, Wisconsin; on a system of farming plan in three States: Missouri, Minnesota, New-York (Cornell). The number of investigators employed on Farm Management Investigations was as follows: Arizona, 3; Colorado, 2; Illinois, 1; Massachusetts, 1 part time; Missouri, 4; New Hampshire, 4 (6 mo.); Cornell, 3 regular, 7 assistants; N. Dakota, 1; Ohio, 3; Wisconsin, 2 and 1 part time; Minnesota, 3.

The funds available for such investigations are: Colorado, $500; Illinois, $1 500; Massachusetts, $500; Missouri, $ 7000; New Hampshire, $600; Cornell, $4 300; Ohio, $6 000; Minnesota, $5 000.

There is a wide divergence in the answers to the questions sent out during the investigation, which indicates the widely differing views held regarding the nature of farm management work. Therefore in view of the great need of a carefully considered plan or outline, suggesting fields of investigation — which may be national or sectional in scope, and other fields which are more or less local — the Committee recommended the following order of investigations:

" 1. A preliminary reconnaissance survey including a history of the agricultural development of the area covered. The type of farming mainly followed aud the nationality and habits of the people on the farms.

"2. A soil survey made by the Soils Department and placed at the disposal of the farm management investigators.

"3. A farm practice survey giving the general farm practices of the State in producing crops, live-stock and other commodities, correlating it with the two former surveys.

"4. A farm management survey having for its aim a complete study of all the conditions governing the agriculture of the region and determining which types of farming are yielding the greatest profits and the factors leading thereto.

"5. Cost of production studies. These may include the cost of certain commodities or products only, or the cost of all the products of the farm, including operation, depending on the facilities available and the point of view of the investigator.

"6. Marketing problems in the many phases presented in every community.

"7. Organization of the farm as a business enterprise, covering the proportionate investment of capital, amount, kind and distribution of labor, amount and kind of live stock, kind of machinery and equipment, changes in types of farming, farm planning and improvements, leading to plans and specifications for equipping and operating farms."

The American Farm Management Association has now over 70 members. The officers are: W. J. Spillman, President; D. H. Otis, Vice-President; Secretary-Treasurer G. F. Warren, (Ithaca N. Y.).

Otis, D. H. **The Farm as a Business Enterprise.** — *The Country Gentleman.* Philadelphia, June 8, 1912. **1211**

When considering an individual farm as a business enterprise it is well to find out how much capital is invested in the business and how it is distributed, and to note if any part of the business is capitalized above or below the amount needed for most efficient results.

The value of a farm may be determined with as much accuracy as any business enterprise. Recently the writer visited a dairy farm of 160 acres to gather some farm management data. The following results are taken from the data collected to illustrate one method of estimating the value of a farm as a business enterprise.

Capital invested.

Land	$ 11 500.00
Buildings	» 4 000.00
Water system	» 500.00
Total permanent capital	$ 16 000.00

Dairy supplies and utensils	$	75.00
Machinery, implements and tools	»	570.00
Harness	»	129.00
Livestock	»	2 145.50
Cash balance to run farm	»	100.00
Total working capital	$	3 019.50
Total of both permanent and working capital	$	19 019.50

On this farm the working capital is nearly 16 % of the tota capital.

The writer has found that on the most profitable dairy farms the working capital ranges from 15 to 30 % of the total capital.

The farm in question is moderately well capitalized with a fairly good distribution of its capital. It may be improved by increasing the working capital, and doubtless all of this increase could most profitably go into more and better livestock or to be still more specific into dairy cattle and hogs.

After the capital invested has been determined, the next question is to find out what returns are being received from it and the labor spent on the farm.

On this particular farm for the past year they were as follows:

The nature of receipts.

Livestock sales	$	1511.20
Livestock products	»	1329.00
Increased inventory	»	530.00
Total	$	3370.20

It will be noticed that the income from the sale of livestock and of livestock products is nearly equal. This is the customary relation that exists between these two items. It is possible however to increase the income from both.

This should undoubtedly come as a result of a judicious increase in the capital invested in livestock.

The next important point in determining the business value of this farm is the expense account which is as follows:

Items of expense.

Stock purchased	$	15.00
Seeds	»	40.00
Feed	»	66.00
Supplies	»	18.50
Permanent improvements	»	250.00
Rent, taxes, insurance	»	68.00
Labor (except that of manager)	»	260.00
Repairs	»	1.00
Total	$	718.50

The expenses subtracted from the receipts give the amount of income to the farm.

This may properly be divided into two separate items as follows:

Interest 5 % on capital invested	$ 950.97
Managerial income or amount left after deducting expenses and interest.	» 1700.73
Total income	$ 2651.70

This income, though not so large as on some farms, is very satisfactory.

To this sould be added the portion of the family living that comes from the farm, such as the rent of the house, vegetables, fruit, meat, eggs, and so forth, which is a considerable item, but one on which it is exceedingly difficult to get any figures.

Collecting, studying and comparing the data from farms in the manner indicated above gives a satisfactory basis for forming a correct opinion as to the business possibilities of any farm. Of course the receipts, expenses and labor income will fluctuate from year to year, and in some years even a good farm may lose money. On the other hand the receipts may be unusually high owing to exceptionally fortunate circumstances. In either case the conditions under which the results where obtained must be carefully weighed.

CLEMENT, THOMAS. **Prospects of Dairy Farming in Scotland.** — *Agricultural Gazette*. London, June 17, 1912. **1212**

Scotland

The members of the British Dairy Farmers' Association made Edinburgh their headquarters for their Conference. The principal feature of their programme in the West of Scotland was a visit to the writer's farm of Netherton in the Mearns district of Renfrewshire, to inspect the herd of milk-record Ayrshire cattle. Mr. Clement gave some facts relating to the management of his dairy herd. The characteristics kept in view were good milk yield and a sound constitution, the essentials to profitable dairy farming. The official tester reported that the average daily yield for the herd was 41.42 lb. of milk of 3.62 per cent butter-fat. In the herd at the present time there were thirteen cows which had already made a record of from 1000 to 1260 gallons in a normal lactation period, and six or eight would probably be added to that number during the present season. The minimum figures, however, were really the most important; there were only six animals which had not made 800 gallons in a lactation period. These, however, gave good promise of producing beyond that figure this year, otherwise they would not be retained in the herd.

The writer in his address on the position and prospects of dairy-farming suggested that the subsidising of bulls from milk-records, by the Government, would be of more advantage to the community than the subsidising of light-legged horses. In his opinion, the dairy farmers could meet foreign competition only by adopting improved methods of manufacture; the prospects of dairy farming, he said, were brighter than ever they had been before, and the whole possibility of increased success lies in increased production. He could not understand why any farmer should continue with cows giving 500 gallons, when he might quite as easily have cows giving 800 gallons. The ratio was far greater than any fluctuations in market values, and more than counterbalanced anything that need be feared in the direction of foreign competition. He attributed the existence of cows with such a low record as 500 gallons to the desire to have a dual-purpose animal; but the maintaining of the dual purpose cow means a small yield of milk every year of the animal's life for the sake of realising £5 to £7 more after it has been fattened. He estimated that in 7 years £60 or £70 was lost on one side in order to gain £5 or £7 on the other.

The dual purpose cow as a dairy cow must remain no longer in the field.

1218 Accountants' Offices for the Study of Farm Economics in Austria.

(Communication by the Chev. de Pozzi, Delegate of Austria to the International Institute of Agriculture).

Austria

Besides the accountant's office (Buchstelle) at Brünn of the German section of the agricultural provincial council of Moravia, which was founded in 1908 and numbers at present upwards of 100 members, other accountants' offices have recently been opened at Vienna, Graz, Klagenfurt, Innsbruck, Cracow and Czernowitz.

Negotiations are pending with the principal agricultural institutions and associations for the establishment of such offices at Dornbirn, Linz, Lemberg and Troppau. The same question is being at present considered by the Bohemian section of the agricultural provincial council of Moravia, as well as by the two sections of the provincial council of Bohemia.

The Ministry of Agriculture favours, by special financial contributions, the institution and working of such offices, and it supplies an expert for the training of the staff.

The special elaboration of statistical data which will be periodically supplied by the accountant's offices will be included, for the first time in the plan of work of the Ministry of Agriculture for the political and commercial course of action which the Ministry, in the interests of agriculture, will take in 1917 in the stipulation of the new treaties of Commerce.

Together with this method of research, agricultural associations and institutions will be consulted on the efficiency of the existing customs' tariffs and they will be empowered to express their desiderata for the future; the drawing up of these wishes will be facilitated by putting at the disposal of the Agricultural Associations and institutions the statistical data collected by the Ministry for the study of the various problems.

AGRICULTURAL INDUSTRIES.

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS.

MEYERS, F. **A Modern Dairy in the Industrial District of Upper Silesia.** (Ein moderner Milchwirtschaftsbetrieb im oberschlesischen Industriegebiet). — *Deutsche Landwirtschaftliche Presse*, XXXIX. Jahrgang, No. 50 and 51, pp. 585-586 and 595-599. Berlin, 22. and 26. Juni 1912. **1214**

Germany

The estate Schamburg near Beuthen (Silesia) possesses about 290 cows, of which 50 are kept in a model cow-house and are used to supply nursery milk for children; these animals are subjected to veterinary inspection.

All the stalls are well ventilated and kept scrupulously clean, the walls being white-washed four times a year. The floor of the model stall is raised 12 ½ in. above the floor of the shed and is very short (6 ft. 6 in. long, and 3 ft. 4 in. wide per cow), so that the excrement falls into the gutter behind the stalls and the cows do not soil themselves when they lie down. In order that their tails may be kept clean, they are attached to ropes suspended from the ceiling, which hold them a little above the level of the ground when the cows lie down.

All the cows are groomed daily and washed from time to time in a special bath-room provided with douches. In order to facilitate cleaning, the cows are clipped in spring and autumn.

The cows are fed throughout the year in the shed, and the rations are adjusted to the milk yield; animals which give the same amount of milk are classed together and receive the same food. In good weather, the cows are allowed to spend some hours in the fresh air.

The udders are washed each time before milking and the straw in their stalls is renewed. The cows are milked three times aday. Galician girls are selected as milkmaids, and each milks 10 to 12 cows; when milking, the milkmaid wears a white overall, which covers her whole dress, and a cap. The most scrupulous cleanliness is exacted from the whole staff employed. There are special bath rooms for the use of the milkmaids and those persons occupied in the milk-room. The milkmaids of the model cowshed are medically examined at intervals. The milk-pails are sterilized with steam each time after use. They have three sieves of copper wire inside (Bienert System); betwen the second and third sieve is a wadding filter, through which the milk drawn from the cow must pass before it reaches the pail, thus being freed from all impurities. As the first milk drawn often contains bacteria, it is never milked into the pails. The milk is poured into a large vessel and thereby again passed through a double filter. It is then taken to the dairy and is here cooled to about freezing-point by means of a 22 HP. electrically driven carbonic acid refrigerator. From the cooler, the milk goes to a collecting basin that is in direct connection with a bottle-filling machine. The latter fills glass bottles containing $^{1}/_{2}$ and 1 litre ($^{7}/_{8}$ of a pint and 1 $^{3}/_{4}$ pint). Immediately after being filled, the bottles are closed with sterilized discs of cardboard and are then ready for sale. All the milk from the dairy, sometimes 550 gallons daily, is bottled in this way. As there is a good market for Kefir and Yoghurt, these products are also made.

The price of milk is at present as follows:

Nursery milk per 1 litre, 35 pfennig (per quart 4 $^{3}/_{4}$*d.*).
» » per $^{1}/_{2}$ litre, 18 pfennig (per pint 2 $^{1}/_{4}$*d.*).
Ordinary milk in bottles of 1 litre, 23 pfennig (quart, 3*d.*).
Milk not bottled (1), per 1 litre, 20 pfennig (quart, 2 $^{3}/_{4}$*d.*).
Kefir, per 1 litre, 40 pfennig (quart. 5 $^{1}/_{2}$*d.*).
Yoghurt, per 1 litre, 50 pfennig (quart, 6 $^{3}/_{4}$*d.*).

The empty bottles are cleaned by an electrically driven bottle-washer, which washes 1 000 bottles per hour and can be managed by one practised person.

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(1) This milk is bought in addition from distant estates.

The Watering of Butter. (Le Mouillage du Beurre). 1215

1* Rolants, E. Extrait d'une communication faite à la Société Industrielle du Nord de la France.

2* Bruno, A. Le Mouillage provenant du Salage des Beurres. — *Annales des Falsifications,* V. Année, No. 44, pp. 308-310 and 311-313. Paris, juin 1912.

France

In these two articles, the effects of salting butter and the removing of salt from it are studied in reference to the proportion of water found in samples considered as having been watered.

M. Rolants, Chief of the laboratory of the Lille Pasteur Institute, speaking of special cases on which he wished himself to pass judgment, says that the detection of the addition of water, when it is stated to be unintentional, is difficult, and such an addition is impossible to avoid in the processes of adding and removing salt from butter. In France, butter is considered to be watered if it contains more than 18 % of water; but in salting operations, at which the writer has been present as an expert, it has been necessary for the incorporation of the salt, to introduce from 1 to 4.5% of water, thus slightly increasing the water content of the butter. Water is incorporated in butter during the washings, which form part of the salt-removing operations; the amount is relatively small, for the proportion of water found in the butter is about 21.5 %. The result of these observations shows that the excess of water found in butter can be caused by:

1. Defects in the making: the butter is not homogeneous, and allows small drops of the liquid to exude.
2. Intentional addition: in this case, the butter is quite homogeneous and looks like an emulsion.
3. An addition, which in the case of butter to which salt has been added or from which it has been abstracted, can be considered as unintentional: when the butter has been made by hand, or with apparatus which does not permit its becoming an emulsion, the increase in the water content is usually slight. When vertical churns are used, on the contrary, large quantities of water are always added with a fraudulent intent.

M. Bruno, Chief of the Central Laboratory for the Suppression of Frauds, opposes to these conclusions a table of analyses, which show that salted butter contains less water than does fresh butter.

When the processes of adding and removing salt are honestly carried out, the butter treated cannot contain excess of water. The fine, almost anhydrous salt, acts almost as a dehydrant; while salting is done in winter, when it is easy to work under conditions of temperature which are unfavourable to the addition of water.

To sum up: M. Bruno thinks that the operations of salting butter and removing the salt from the latter afford opportunities for this paying method of adulteration; but that an increased water content is not due to these processes.

1216 BORREMANS, M. J. **The Butter and Cheese Industry in the Netherlands.** (L'industrie beurrière et fromagère aux Pays-Bas). — *Laiterie et Elevage,* 7e Année, No· 7-8, No. 9-10, pp. 64-67, pp. 75-79. Louvain, 30 avril et 30 mai 1912.

Netherlands

In the Netherlands, more than half the productive agricultural land is pasture. This is very advantageous to the milk industry. Further, the Dutch farmer obtains his principal returns from keeping cattle, owing to the low price of grain; these animals play a very important part: on every 100 acres of productive agricultural land 38 head are kept.

The manufacture of butter and cheese occupies an important position. Some decades ago Dutch butter was ousted from the European markets by superior butters from other countries; adulterations with margarine, etc., also injured its reputation, The Government and Agricultural Associations are trying to remedy this evil.

In 1882, in the Province of Friesland, the first dairy was established, and as this proved successful, other dairies quickly followed. In districts where the prices for milk-products are not very high, hand-labour is often used in the dairies; but steam machines are most commonly employed. Some of the dairies produce over 440 000 lbs. of butter annually.

They are mostly in the hands of cooperative associations, but some private dairies also exist. Their number was as follows:

	Private Dairies	Dairy Associations
1900	292	584
1910	278	680
No. of above with steam power	241	379

The equipment of the dairies is very up to date; many possess refrigerators, or ice-cellars, in order to be able to supply good butter also in summer.

The purity of the butter is tested by Butter Control Stations. The Director and testers take samples of the butter, which is made in their presence in the dairies and, as often as they consider advisable, they also take samples from the butter in the market, or which is sent out by the said dairies. By analysing the different samples and comparing the results, any adulteration can thus be detected.

The Stations are under Government supervision and are supported by the State. Individual agriculturists as well as Associations can be members of the butter control society. The butter belonging to members is distinguished by a paper label with the inscription : *Nederlandsche boter controle.* The Station to whose control the butter is subjected is shown by certain figures. In 1910, there were 8 such Control Stations which included amongst their members nearly all the dairies. Any member can be excluded from membership without the reason being specified; thus undesirable elements can be kept out.

The Dutch butter exported finds its way chiefly to England, Germany and Belgium. It rose from 50 400 000 lbs. in 1902 to 72 334 000 lbs. in 1910.

The Dutch cheese industry turns out only hard cheeses, particularly Gouda (whole milk), Edam (half-milk) and some kinds of skim-milk cheese. In 1910, there were 277 cheese factories.

Cheese Control Stations have been founded similar to the butter control stations; but they are not under Government supervision, although supported by the State.

As in the case of butter, most of the cheeses are exported to England, Germany and Belgium; in 1910, the total export to these three countries amounted to 77 146 000 lbs.

DOUGLAS, LOUDON M. **The Meat Industry.**—*Royal Society of Arts. Proceedings of the Society. Cantor Lectures.* London, 1912. **1217**

THE BULLOCK AND ITS PRODUCTS.

United Kingdom

The Extent of the Meat Industry. — The Author begins by regretting that in the United Kingdom there never has been any attempt to supply systematic education to the meat industry as has been provided for other branches of the food supply, such as dairying; but at the same time he recognizes that much progress has been made in the organisation of meat purveyors during the last quarter of a century. During that time the National Federation of Meat Traders' Associations of the United Kingdom has come into existence and includes some 150 local associations with a membership of over 20 000.

Some idea of the vastness of the meat industry may be gathered from the statement that in Europe alone there are over 121 000 000 cattle, in North America there are approximately 80 000 000; in

South America about 43 000 000; in Asia 97 000 000; Australia 12 000 000; Africa 1 250 000.

The greatest market in the world for the purchase of meat is the United Kingdom, which has the greatest consumption of meat per head of its population, and it is remarkable that while the importation of meat from over-seas increases from year to year the British cattle population remains pretty stationary at about $11^{3}/_{4}$ millions (7 114 264 head in Great Britain and 4 688 888 in Ireland according to the agricultural returns for 1911), of which it is computed that about 25 % or something under 3 millions are slaughtered yearly. But the cattle so handled are utilized almost exclusively from the point of view of the meat purveyor and not from that of the packing-house which has not yet developed in the United Kingdom.

In the United States there are 936 packing-houses, many of which ship their products to Europe and principally to British markets. Of cattle alone they handle something like 8 000 000 per annum, and while this number is constantly on the increase, the exports are becoming smaller and smaller, owing to the increase of the population of the United States and the local demands. While the meat supplies from North America into the United Kingdom have dwindled, those from South America have increased enormously. Nevertheless the packers of North America endeavour to keep their hold on the British trade, and a number of American packers have recently purchased 9 000 000 acres of land in Brazil for the purpose of ranching cattle and other live-stock so as to supply the increasing demands in Europe and the British markets.

Imports of foreign meats.—The following table gives an idea of the extent of the importation of meat into the United Kingdom. The countries which supply it are those where the handling of meat products has been most highly developed and where the greatest possible care is taken to utilise all the residual products.

The Meat Industry in the United Kingdom. — In the United Kingdom the breeding of cattle has been specialised more than in any other country. But it is only recently that a certain uniformity of method in judging cattle has been adopted by breeders and butchers. This progress dates only from 1895, in which year the Smithfield Club of London, which holds the most notable fat stock show in the United Kingdom, provided a class for what is known now as the "block test" in lieu of the previously prevailing "breeders' points". With the block test the animals are judged alive first and subsequently in the carcass. This principle since then has been introduced at many fat stock shows and has shown

Imports of Foreign Beef into the United Kingdom.

	Meat	Quantities			Values		
		1909	1910	1911	1909	1910	1911
	Beef, fresh and refrigerated	cwts.	cwts.	cwts.	£	£	£
Fresh	from Denmark	54 773	42 293	4 125	131 926	107 750	11 188
	» other countries	7 551	14 641	5 210	18 079	33 400	11 456
	Total . . .	62 324	56 934	9 326	150 005	141 150	22 644
Chilled	From U. S. A.	830 689	469 444	169 444	1 900 858	1 056 722	387 296
	» Uruguay . . .	—	—	—	—	—	—
	» Argentine Rep.	1 826 612	2 710 747	3 753 140	3 351 245	4 950 326	5 902 818
	» Australia . . .	2 180	2 226	2 240	3 965	3 402	3 670
	» New Zealand .	—	—	129	—	—	242
	» other countries	4 092	9 348	8 084	10 259	12 348	10 456
	Total . . .	2 663 573	3 191 765	3 933 037	5 266 327	6 022 798	6 304 482
Frozen	From U. S. A.	25 527	7 703	4 906	48 478	13 577	10 305
	» Uruguay . . .	127 924	142 269	65 485	175 149	202 645	88 543
	» Argentine Rep.	2 381 543	2 188 122	2 357 878	3 382 328	3 306 658	3 339 268
	» Australia . . .	409 397	878 469	708 388	586 371	1 236 091	964 050
	» New Zealand .	454 368	532 830	257 806	660 319	797 535	374 023
	» other countries	15 866	17 406	25 608	24 429	24 692	32 908
	Total . . .	3 414 625	3 766 799	3 420 071	4 877 074	5 581 198	4 809 097
Total of beef, fresh and refrigerated					10 293 406	11 745 146	11 136 223

breeders the necessity of diminishing the production of excessive fat of comparatively low value, and of conforming to the standards required by the meat purveyor. This transition in meat production is however far from being complete and there is something still wanting in the judging of animals, so as to make the points of the live animal correspond to the points of the carcass, as is shown by the following table.

Awards in the Special Slaughter Class for Carcass Competition, Smithfield Club Show, 1911

Steer Not Exceeding Two Years Old.

No.	Live Weight			Carcass Weight		Suet, Caul, Reed Fat.	Fat, Gut Fat Trimmings	Tongue, Tail	Head, Feet	Heart, Liver, Lights	Tripe, Feck, Reed	Hide	Intestines	Placed by Judges alive	Carcass Award
	cwts.	qrs.	lbs.	stones (8 lbs.).	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
593	12	1	11	115	6	18	34	13	55	38	86	93	16		
594	10	1	14	93	5	16	21	11	48	34	86	84	17	3rd	
595	14	3	8	140	6	16	25	13	61	38	132	112	16		
596	13	2	18	126	5	25	40	12	61	34	100	108	20	R.	
597	10	3	15	99	5	18	31	11	51	35	95	79	16		3rd
598	10	2	14	95	0	16	20	11	51	35	97	78	12		
599	10	2	2	91	1	16	33	12	49	30	113	85	18		
600	10	1	12	96	1	13	23	9	50	30	91	76	12		1st
601	9	3	23	91	4	17	33	10	44	29	89	71	13	2nd	4th
602	11	1	18	101	7	19	24	10	50	34	123	80	15		R. No.
603	8	1	16	71	4	20	17	9	39	25	106	69	11		R. No.
605	11	2	22	106	0	12	32	11	44	40	116	76	18	1st	2nd

Similar discrepancies are shown by other tables given by the author for steers between two and three years old, and for heifers not exceeding three years.

In the best classes of animals the dressing-out weight seems to reckon out at between 60 or 65 per cent.

The products from cattle at these carcass competitions are such as are generally recognized throughout the United Kingdom and consist of: 1. the carcass; 2. suet, caul, reed fat; 3. fat gut fat, trimmings; 4. tongue, tail; 5. head, feet; 6. heart, liver,, lights; 7. tripe, feck, reed; 8. hide; 9. intestines.

The method of slaughter which is most frequently adopted in the United Kingdom consists in stunning the bullock with either a pole-axe, pistol or humane slaughtering apparatus, a perforation being made in the middle of the roof of the cranium; the Jewish method in which stunning is not adopted is conducted by severing the blood vessels and arteries of the neck; this also is permitted.

In the United Kingdom there are both public and private abattoirs. According to the author it would be desirable to centralise the whole business of slaughtering and handling of meat products in public abattoirs: the ante-mortem and post-mortem examinations can be better carried out in public institutions than in private establishments, and the profit of handling a bullock in a private abattoir is not nearly so great as in a public institution, as is shown by the following comparison:

Comparison in the Values realised for a Steer as handled in a Public Abattoir compared with the Private Slaughterhouse.

PUBLIC ABATTOIR.

Cost: — Small Steer £21.

	£	s	d
1. Beef, 700 lbs. at 5⅞ *d* per lb.	17	2	8½
2. Edible offal.		15	0
3. Hide and skin, 82 lbs. at 6¾ *d*.	2	6	1
4. Fat, 43 lbs at 2½*d*		8	11½
5. Belly and feet.		4	7
6. Intestines		2	0
7. Blood			3
8. Gall			2
9. Lymphatic (and other) glands			3
	£21	0	0
	20	12	4½
Difference		7	7½

PRIVATE SLAUGHTERHOUSE.

Cost: — Small Steer £21.

	£	s	d
Beef	17	2	8½
Edible offal		15	0
Hide and skin	2	4	5
Fat		6	3
Belly and feet.		3	0
Intestines		1	0
Blood	Nothing		
Gall	»		
Lymphatic (and other) glands	»		
	£20	12	4½

At present the age of the highest grade beef animals at maturity is from twenty-four to thirty months. The younger the animal the greater the amount of water in its flesh; in a half fat animal the water content may be put down at 50 per cent, decreasing to about 43 per cent in a fat animal.

The cutting up of the carcass is carried out differently in various parts of the country, but the main principles are the same and the sale price of the whole carcass works out pretty much the same. Besides the meat the number of commodities which may be produced from a bullock is something like 146, among which pepsin and rennet from the stomachs of calves, pancreatin from the pancreas, the products of the thyroid and suprarenal glands etc.; in some of the large packing houses of America quite a large development has taken place in the preparation of pharmaceutical products. In Great Britain the carcasses which are condemned as unfit for human food are converted into fat, which is used in soap making and into a dry impalpable powder which may be used for feeding purposes or as a fertiliser. In Germany only such portions of the carcass as exhibit local signs of disease are thus transformed; the remainder is cooked and sold in a shop (Freibank) attached to each public abattoir.

Pickling of Meats. — There is a wide field in connection with the pickling of meats not only in the curing of beef but in the curing of ox-tongues, which are also largely imported from abroad. In Scotland the preparation of beef hams is at present a very considerable industry. There is also a large trade in beef sausages.

In the conclusion of this chapter the author insists again upon the necessity of technical education for those engaged in the meat industry, which might easily be imparted by the twenty-two agricultural colleges existing in the United Kingdom. He recommends the question to the Minister of Agriculture and to the National Federation of the Meat Traders' Associations.

THE SHEEP AND ITS PRODUCTS.

There are many varieties of sheep in different countries. In the United Kingdom alone there are some thirty-two different kinds, but in general more regard has been paid to the wool product than to the carcass. It seems to be well estabished, however, that it is difficult to get a large produce of wool together with a large carcass. The food is utilised either for the production of mutton or the production of wool. The type which has undoubtedly influenced the various races to the greatest extent is the merino (introduced into the United Kingdom from Spain about the year 1786) which, crossed with many English breeds, had the effect of increasing the weight of the carcass.

The distribution of sheep throughout the world is totally different from the distribution of cattle, the latter being in general more dense where the former are less so, and *vice versa*.

Thus there are:

In Europe	160 036 801
» N. America	67 771 781
» Central and S. America	97 723 396
» Asia	45 758 478
» Australasia	109 492 319
» Africa	1 322 568
	482 105 343

The consumption of mutton and lamb in the United Kingdom in 1911 reached a total of 594 719 tons, which is equal to 12 960 383 carcasses. Those imported come from Australia, New Zealand, Argentina, Uruguay and Patagonia, and are the produce derived from British-bred animals which, from time to time, have been imported there.

The home supply of sheep is fairly constant, the figures for 1911 being 30 479 807; it is computed that out of that number about 40 per cent are slaughtered every year. The home supply of mutton can therefore be computed at 326 570 tons, as compared with a total import of 268 149 tons. In carrying on this business there are 57 freezing works in Australasia and 11 in South America; their whole produce, with a very slight deduction, is shipped to the United Kingdom by 205 refrigerated steamers. While the consumption of mutton is constantly on the increase, the ratio of sheep produced in the United Kingdom to the population is constantly on the decline. In 1871 the total of the flocks in the United Kingdom exceeded the population by 4 per cent. In 1881 there were 827 sheep to every 1000 inhabitants and in 1910 the number had fallen to 650 per 1000.

In judging a carcass, the process should be, first of all, to divide it transversely through the middle, so as to expose what is known as the " eye " of the chop, and the principal features to be noted will be the colour, then the thickness of the lean, after that the firmness of the fat. The legs of mutton should be plump, and form an almost straight line from thigh to thigh. V-shaped legs are of an inferior quality and will most likely present other features of bad breeding. The question of judging mutton has only within recent years been reduced to something like a system, and the following standard set up which appears to meet the requirements of the case.

1	Dressing of carcass	10
2	Colour, general appearance and firmness of flesh	10
3	Proportion of meat to bone	15
	On splitting the carcass and dividing it transverserly, the following points are to be noted:	
4	Colour, texture and thickness	10
5	Plumpness of legs of mutton	20
6	" Eye " of the chops and thickness of loin	25
7	Fleshiness of the fore quarters	10
	Total	100

The importation of foreign mutton began within recent times. In the year 1880 the shipment of mutton carcasses from Australia numbered only 400 as compared with 1 281 707 in 1911. Mutton is generally carried in the frozen condition or at a temperature some 12° F. below freezing point, which means that a certain amount of loss of meat juices supervenes on the thawing out. If therefore the chilling at a temperature of about 28° F. could be adapted to the handling of mutton it would be a great advantage.

The next principal product of sheep is the wool, which in many countries is considered to be the chief product, especially so in Australia where the merino predominates. With regard to Argentina there has been a considerable modification in the breeds owing to the introduction of the Lincoln type about 1845, followed in later years by Leicesters and Romney Marsh. Wool is however the main product of the Argentina sheep farmer. Since 1883 a steadily increasing exporting mutton trade has developed.

Among the many other products obtainable from sheep, the author mentions and describes the following: Sheepskins; blood (in Ireland it is used for the production of a particular kind of sausage called " Drosheen "); hams (especially in Scoltand); sausages (in the Midlands of England); fat, very largely used for the covering of meat paste preparations; intestines (violin strings, belts for sewing and other machines). The author advocates the teaching in the United Kingdom of the utilisation of the residual by-products of the sheep.

THE PIG AND ITS PRODUCTS.

The breeding of pigs is practised to a great extent in the United Kingdom. In Ireland and in the North of England the rural householder often maintains one or more pigs so as to utilise the food residues from the household, but otherwise the pig is mostly associated with agriculture.

The British breeds of swine have been introduced into all countries as improved breeds. Among them the breeds which stand out pre-eminently above all the others in the United Kingdom are the following:

The Large White Yorkshire.
The Middle White Yorkshire.
The Large Black Sussex.
The Tamworth.
The Berkshire.
The Lincolnshire Curly Coated Pig.

In many countries the rise in the population of pigs has been very great, proportionate to the continuous and increasing demand for pig products. The number of pigs throughout the world may be stated at 142 272 275 of which: 59 288 592 in the United States; about 22 000 000 in Germany; a little over 4 000 000 in the United Kingdom (2 892 154 in Great Britain, and 1 200 005 in Ireland, in 1911).

The imports alone of bacon and the principal pig products are of a gigantic nature and represent a value of 20 million pounds sterling per annum, as may be seen from the following table.

In addition to these imports there are other pig products which represent vast sums of money such, for example, as lard, which is imported to the value of £4 251 758, and minor products such as pigs' bristles, gelatine and margarine, a large proportion of which consists of lard derived from pigs. Besides these again, there are food preparations in tins and glass moulds, etc.

The breeds of pigs mentioned above are not looked upon as being desirable in themselves for making the best pig products. The cross-bred pig is generally preferred, especially for bacon curing purposes. It is also known that an animal weighing 12 stone dead weight, and being equal to about 15 ½ or 16 st. live weight should arrive at maturity in from 7 to 8 months. As a comparative basis the author considers a well-balanced food will consist of: 1 gallon separated milk, 3 lbs. potatoes and 4 lbs. barley meal per pig per day, the ration being divided up into three portions and given at regular intervals during the day.

In the bacon-curing factories in the United Kingdom about 1 716 000 cwts of bacon and 457 000 cwts of hams are manufactured every year, and these amount to a total value of £7 023 000, which together with other products such as salt pork, lard, sausages, etc., bring the total up to £10 509 000, employing 7294 persons in the

Imports of Bacon, Ham and Pork into the United Kingdom.

		Quantities			Values		
		1909	1910	1911	1909	1910	1911
		cwts.	cwts.	cwts.	£	£	£
Bacon	From Denmark . . .	1 809 745	1 794 416	2 122 087	5 801 382	6 341 726	6 690 937
	» U. S. A. . . .	2 189 053	1 306 921	1 817 835	6 057 473	4 453 293	5 067 533
	» Canada	443 386	411 935	615 807	1 364 357	1 449 637	1 793 946
	» other countries	183 279	350 117	313 009	578 453	1 146 618	910 998
	Total . . .	4 625 463	3 863 389	4 868 738	13 801 665	13 391 274	14 463 414
Hams	From U. S. A. . . .	1 07 569	665 775	887 303	2 952 084	2 329 626	2 712 287
	» Canada	53 593	37 621	62 295	154 222	138 232	197 524
	» other countries	1 867	15 730	5 213	6 590	58 837	17 799
	Total . . .	1 129 029	719 126	954 811	3 112 896	2 526 595	2 927 610
Pork salted not bacon or hams	From Denmark . .	197 594	179 888	186 477	193 501	190 529	186 439
	» U. S. A. . . .	55 639	38 866	45 769	113 555	101 645	99 057
	» other countries	5 306	8 437	4 503	5 806	11 994	7 667
	Total . . .	253 539	227 191	236 749	312 862	304 163	293 163
Pork, fresh and refrigerated:							
Fresh	From Netherlands. .	378 376	366 197	370 345	905 741	900 116	940 068
	» Belgium . . .	10 215	8 848	14 537	25 359	24 006	41 645
	» other countries	25 945	54 207	16 225	63 628	1 44 111	34 422
	Total . . .	414 536	429 252	401 107	994 728	1 068 233	1 016 13
Chilled	From U. S. A. . . .	878	—	—	1 694	—	—
	» other countries	—	—	—	—	—	—
	Total . . .	878	—	—	1 694	—	—
Frozen	From U. S. A. . . .	6 377	1 044	4 099	14 200	2 880	9 324
	» other countries	6 653	49 611	47 726	12 700	126 684	95 30[illegible]
	Total . . .	13 030	50 655	51 825	26 900	128 564	104 629
Total of Pork, fresh and refrigerated		428 444	479 907	452 932	1 023 322	1 196 797	1 120 764

industry. To the latter must be added something like 10 000 pork purveyors who must handle at least an equal quantity of pigs which are converted into fresh pork and smaller products.

In the United Kingdom it is the custom to pay for the pigs by live weight. In some districts pig-breeders prefer to be paid be the dead weight, *viz.* the weight of the carcass minus the primary offal, consisting of the hair, blood and viscera. If the weighing takes place while the animal is still warm there is a deduction made varying from 2 to 4 lbs. per carcass, according to local customs, for loss by evaporation.

In Russia, Hungary, France and some other countries the bristles from the back of the pig are cut off. The hair of British breeds being of a soft or silky character does not lend itself to this business. In 1911 the United Kingdom imported 4 727 063 lbs. of pig bristles at a value of £709 180, the average price being about 3*s* 6*d* per lb.

Among the by-products in bacon factories there are: blood-puddings, which are simply composed of pigs' blood, some barley or groats, pieces of fat and flavouring herbs and spices; pork sausages, of which about 5000 tons are produced every year in the United Kingdom; lard, of which in 1911, 1 719 292 lbs. were imported from the United States and 103 468 lbs. from other countries, for a total value of £4 251 758.

The intestines are largely in demand for sausage making; the bladder is utilised for the packing of lard; the stomach for pharmaceutical preparations and for food; the hoofs, bones etc. are converted into gelatine, fertilisers etc. In Scotland particularly, there exists a considerable business in the tanning of pigs' hides.

1818 BLANC, G. **Biological Methods for the Detection of Horse-Flesh in Pork-Butcher's Meat.** (Les méthodes biologiques et la recherche de la viande de cheval dans les produits de la charcuterie). — *Annales des Falsifications*, V Année, No. 44, pp. 274-281. Paris, juin 1912.

France

M. Blanc, director of the Laboratory for the Examination of Preserved Meat for the Army, has already published (in 1911) a detailed account of the method of "precipitating serums," for use in detecting horse-flesh in pork-butcher's meat (1). The principle is as follows: the serum of a rabbit which has received repeated intravenous or intraperitoneal injections of horse serum precipitates *in vitro* macerations of horse-flesh. The process consists of two distinct operations: preparation of the anti-serum; and preparation of the maceration and its precipitation.

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(1) *Annales des Falsifications*, No. 28, p. 49 (Février 1911).

After calling attention to certain modifications of detail which simplify the technique, particularly in the preparation of the maceration, the Author replies to those who consider the method too delicate.

The activity of the anti-serum is measured by the dilution in physiological water (8.50 ‰ NaCl) of horse serum which it is capable of turning cloudy after two or three minutes. The most sensitive anti-serum that can be obtained practically is 1 : 20 000 ; this can detect 5 % horse-flesh. A serum-precipitation with this is sufficient proof of adulteration, as a smaller proportion than this would not be worth adding as adulterant, while a larger proportion could not result from defects of manufacture due to lack of care or to defects in apparatus or machinery previonsly used for preparing horse-flesh products.

The anti-serum is prepared by injecting horse-serum into the rabbit's blood four or five times at intervals of five days, till the activity of 1 : 20 000 is obtained by trial of samples of anti-serum from the blood. As soon as the animal is ready, it is bled to obtain all the serum; this is then placed in 2 cc tubes which are sealed and cold-stored. The preparation of the anti-serum is the most difficult and risky part. The result is often very difficult to obtain; there are some animals which do not react, and whose serum never passes a very feeble activity. Hardly more than 10 % of the rabbits under experiment give an anti-serum of the desired strength; but the anti-serum obtained is rigorously specific for horse.

The sample of meat is taken from the inside of the product, and as much fat as possible is removed from it by forceps and scalpel. The maceration goes on for 48 hours in the cold, using physiological water. The liquid part is decanted and centrifuged, so as to get it perfectly clear.

The serum-precipitation is carried out on this clear liquid, side by side with controls containing (1) no anti-serum, (2) maceration obtained in the same way from pure pork sausage, (3) similar maceration obtained from mixed pork and beef sausage. These operations are very delicate and all the precautions suggested by the Author must attended to, the technique described in these two memoirs being scrupulosuly followed.

The Author insists that in any one series of trials, anti-serum coming not only from the same animal but from the same bleeding must be used.

After a certain amount of practice, and by comparison with types of horse-flesh of different compositions, it is readily possible to judge the horse-flesh content of the product examined to within 10 or 15 % according to the cloudiness of the tubes.

INDUSTRIES DEPENDING ON PLANT PRODUCTS

The Antigua Central Sugar Factory. 1219

(1) The Antigua Sugar Factory. — *The Agriculturvl News*, Vol. XI., No. 263, p. 163. Barbados, May 25, 1912.
(2) SAHASRABUDHE G. N. The Antigua Central Factory. — *The Agricultural Jornal of India*, Vol. VII, Part. II, pp. 133-146. Calcutta, April, 1912.
(3) ID. Sugarcane Cultivation in the Leeward Islands. — *Ib.*, pp. 146-159.

Leeward Islands: Antigua

The Antigua Central Sugar Factory has a peculiar interest as being the pioneer central factory in the Leeward Islands. Though the sugar industry is the mainstay of these islands, and though this industry had been successfully carried on for about two centuries, till the end of the last century, nobody thought of introducing modern methods of sugar manufacture in these islands. At last the Antigua Central Factory was started in 1905, and its development may be assumed as representative of the state of modern sugar industry in the Leeward Islands.

From the seventh annual report of the Directors of the Antigua Sugar Factory, Ltd. the following data concerning the working of the factory may be reported here.

The cane supplied has been as follows:

	1907 — tons.	1908 — tons.	1909 — tons.	1910 — tons.	1911 — tons.
Contracting planters . . .	28 046	26 912	20 576	24 065	22 506
Outside estates	8 689	12 905	14 646	20 712	29 398
Peasants.	4 047	3 243	2 062	3 542	3 212
Totals . . .	40 782	43 060	37 284	48 319	55 116

The sugar made and the yield per cent. of canes have been as follows:

	1907 —	1908 —	1909 —	1910 —	1911 —
Sugar made, tons	4 230	4 695	3 995	5 390	5704
Yield, per cent. of canes. . .	10.07	10.90	10.72	11.16	9.93

The prices of sugar per ton have been: 1907; £9,16s; 1908, £11,15s.9*d*.; 1909, £10,7s. 5*d*.; 1910, £12,16s,8*d*; 1911, £10,11s. 5*d*.
The working figures for the last season, 1911, were as follows:

Sucrose in juice, tons	6661
Recovered sugar in juice, per cent	82.20
Water in megass, per cent	47.15
Normal juice lost in megass, per cent. of fibre	70.03
Average composition of first mill juice:	
Total solids, per cent.	20.92
Sacrose, per cent.	18.49
Purity, » »	88.39
Total juice, including maceration water:	
Total solids, per cent.	18.85
Sucrose, per cent.	15.87
Purity, » »	84.16
Maceration water, per cent. on first mill juice	11.00

The last figure, namely 11 per cent. for maceration water on first mill juice, serves as an indication of the serious difficulty in obtaining water, and accounts generally for the inferior work of the season. In fact, Antigua suffered greatly in 1911 during both the growing and the crop seasons from the lack of rain, the record being the lowest for the past 20 years with the exception of 1905-06. So that, with the enlarged plant and the extended acreage, there should have been, under normal conditions, a higher yield from the canes and an increase in the sugar output of 30 per cent. on that of the previous year; instead of this the yield has been much worse, and the output shows hardly any increase at all.

The total price per ton payed to the contracting planters on their canes has been 10s. 10.34*d*., to outside estates 12s. 2.03*d*.

1220 **A Cane-Sugar Farm in Mexico.** (Produccion de caña y de azucar en una hacienda del Estado de San Luis Potosi). — *El Hacendado Mexicano*, Año XVIII, Vol. 10, CCXI., pp, 213-214. Mexico, Junio 1° de 1912.

During the 1911 sugar-cane season the production of cane and that of sugar in an extensive farm in the State of San Luis Potosí were carefully checked. This estate lies in the belt of hot lands; the plantations are irrigated and the plant used for extracting the sugar consists mostly of modern machinery. Thus, the data collected may serve as a valuable indication as to the conditions and future of the sugar industry in Mexico.

Mexico: S. Louis Potosi

The area under cane is 1288 acres, with an average yield per acre of 19.9 tons. It should be noted that in the State of Veracruz the yield is higher. The greater yield was secured with ratoons of the second and third year, realising a production of 25 to 30 tons per acre. (1). The lowest product was obtained with rhizomes from 6 to 12 years. Again, in an experiment with the variety Demerara-74, a crop was secured of 35 to 40 tons per acre. The average cost per ton was 2.42 pesos ($ 1.21 or 5*s*.).

The season usually begins on the 1st January and ends on the 31st May. The extraction yielded only 65 % of juice, with a sugar content of 15.7 % and degree of purity 86. To produce 1 ton of granulated white sugar 10 tons of cane were required; this means a yield of 10 % of the finished product, which delivered at the nearest station, was sold at a price ranging from 6 to 8 centavos (3 to 4 cents, 1 ½ to 2*d.*) per pound. Besides this, from the molasses remaining as the residuum of centrifugation, there was obtained, after fermentation and distillation, 150 000 litres (34 000 Am. or 33 000 Eng. gallons) of rectified alcohol of 96° strength, of a value of 22 to 23 centavos per litre (48 ½ to 50 ½ c. per Am. gallon, 2*s.* 1*d.* to 2*s.* 2*d.* per Eng. gall.).

On these bases the cost of production of sugar, from the cane on the field to delivery of the sugar at the station, is calculated at 3 centavos (1 ½ c., ¾ *d.* per pound, reckoning that the by-products or "moscabados" were sold at 5 centavos (2 ½ c., 1 ⅓*d.*). per pound.

This would yield a margin of profit allowing of the cultivation of the sugar-cane even on a small scale. Farmers having a little land in the vicinity of sugar factories could realise a good profit by cultivating the sugar-cane and selling it at 5 to 7 pesos ($ 2,50 to $ 3.50) per ton (11*s.* 3*d.* to 15*s.* 9*d.* per English ton) delivered to the railway station or to the establishment. Assuming a production of 30 tons (33 English tons) of cane per acre and a price of 7 pesos per ton, the gross proceeds obtained are 210 pesos ($ 105, £21 11*s.* 6*d.*), and, deducting from this 75 pesos ($ 37.50, £7.14*s.*) cultivation expenses, a net profit remains of 135 pesos ($ 67.50, £13 17*s.* 6*d.*) per acre.

In this connection it is pointed out that in the State of Veracruz there are large plantations with plenty of unused land which the owners would be prepared to dispose of on advantageous terms, and which would enable the farmers to secure a good return for the product of their labour. It is consequently thought desirable to introduce into Mexico the cultivation of the sugar-cane by farmers and settlers, which give excellent results in Cuba.

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(1) The Mexican ton is 2029 lbs., and the pound is 1.0144 lbs.

1821 **The Standardisation of the Methods of Wine Analysis.** (L'Unification des méthodes d'analyse des Vins). — *L'Informateur*, 5^e Année, No. 43, pp. 262-266. Paris, juin 1912.

France

At the General Meeting of the International Committee of the Trade in Wine, Ciders, Spirits and Liqueurs, held May 24, 1912, M. Rocques, at the request of the Bureau of the International Committee, set forth the present condition of the question of the standardisation of the analyses.

It is a question of the greatest practical importance, for trade is often hindered by the difficulties which arise in the application of international regulations when the chemists are not agreed. The latter themselves recognize the need of such standardisation. In fact, at all the International Congresses of applied chemistry, from the one held at Brussels in 1894, to that held in London in 1909, the question of the standardisation of methods of analysis has always been included in the order of the day; and the fact that it has not been solved more rapidly is due to great difficulties both practical and scientific. During the last few years, however, a great advance has been made, as the matter has received government attention. In France, notably, the Ministry of Agriculture and the Service of the Repression of Adulteration, by the labours of its permanent technical Committee, have standardised the methods of analysis for all the official French Laboratories. The Central Laboratory of France has even carried the question of standardisation further, by itself preparing certain standard liqueurs, which it sends to all the official laboratories.

With the same end in view, the French Government convened an International Conference, which met at Paris on June 25, 1910, with the object of studying the methods of international standardisation of analyses. Sixteen countries were there represented by delegates and four other countries adhered.

That the task was no easy one, is shown by the fact that this conference, which discussed the matter for a week, well understood that it was impossible to accomplish their object in so short a time. It limited its exertions to standardising the method of presenting the results and to the adoption of common unities. At the close of this conference, a protocol was drawn up, signed by all the adhering States, by which uniform methods were adopted for the presentation of the results of the analyses.

To obtain standardisation of the methods used, it was recognised that a permanent and suitably equipped institution is necessary provided with laboratories and keeping abreast of the developments of science, and supplied also with bureaus analogous to the International Bureau of Weights and Measures. France is charged to take the initiative in the organization of this international bureau.

In order that some result of this discussion should be put on record, M. Rocques prepared a resolution of which the following are the essential passages:

" The International Committee of the Trade in Wines, Ciders, Spirits and Liqueurs,

" Recognising once more the necessity of bringing about the international standardisation of the methods of analysis of wines, spirits and food products in general.....

" Noting with pleasure that thanks to the Service of the Repression of Adulteration, and to the labours of the permanent technical Commission for the repression of adulteration, this standardisation has already taken place in France, and that the official laboratories are obliged to employ the official methods elaborated by the said commission..... brings forward the resolution:

" That the French Government, in accordance with the resolution brought forward by the International Conference of 1910, should hasten the formation of an International Bureau for the purpose of standardising the methods of analysing food products."

This resolution was unanimously adopted.

M. Sanchez-Calzadilla drew the attention of the assembly to the necessity of giving to the analyses an interpretation, which does not exclusively depend on the analytical results obtained by uniform methods; it is necessary that great attention should be paid to the local conditions of wine production. He pointed out that it had already been proved that the natural wine of one country could be classed among the adulterated wines of another, and stated that it was above all necessary to avoid arbitrary judgments of this kind, which might injure the wine trade.

In reply to these remarks: M. Mathieu stated, that henceforward the interpretation of the analyses, can be made very scientifically, inasmuch as the chemist compares these analyses with those of wines suitable for comparison. It is difficult to frame fixed regulations regarding the composition of wines; they vary with the year, the district, and the method of wine-manufacture; it is the work of the analytic-chemist to find comparable samples. This difficulty could also be solved by measures similar to those employed by the Ministry of Agriculture of the French Republic, which recommended the communes and wine-making syndicates to establish a wine record-office amongst themselves, and suggested that the wine-making stations should collect documentary evidence on authentic natural wines.

1228 GAUTIER, H. and GUÉRIN, P. **The Methods for the Expert Examination of Hops.** (A propos des expertises relatives au commerce des houblons). — *Annales de la Brasserie et de la Distillerie*, Nos. 10 and 11. Paris, 21 mai and 10 juin 1912.

France

The observations of M. Gautier, director of the Paris Higher College of Pharmacy, and M. Guérin, lecturer at the same, on the chemical characteristics of a large number of varieties of hops, show that for commercial purposes the methods based on these characteristics, and which are used by most of the experts, are very uncertain.

For the physical examination, the process based on the average distance apart of the bracts on the cone is insufficient for determining the fineness of the hop. While this may be successful for certain highly superior varieties, in most cases different samples of hops of equal value give very different results; consequently this method often places certain varieties below others which really have a lower value. Owing to the great variations in spacing of the bracts generally found in any one sample, this method cannot be used to determine the origin of a particular sample, nor as an indication of mixing, still less to determine the proportions of mixing.

Judging by the number of seeds is no more sure than the preceding. Among hops of the same market value one variety may have ten times as many seeds as another, and a superior hop may give far more than a much less valuable one.

The amount of shed bracts is sometimes employed as a measure of quality. But owing to the various manipulations between picking and arrival at the consumer's, the amount of shedding may be considerable without the sample being necessarily old. For the same reason an unequal distribution of seeds and loose pieces in the pocket cannot give any useful indications.

Chemical analysis can be of value only in determining whether the goods delivered are identical with the sample on which purchase was based. Otherwise chemical analysis can no more be used to establish the type of hop than to distinguish Bordeaux from Burgundy wine, for example.

The only character on which a real appreciation of hops can be made is the aroma.

The Authors consider that chemical analysis alone is generally devoid of value, and that no court ought to name a chemist as sole expert in a suit about hops. The only competent experts from this point of view are brewers and hop-factors.

They also believe that the only case in which analysis, either chemical or physical, can have a practical value is in the comparison of a consignment with the sample on which the purchase was agreed to. It is evident that if the two lots show similar composition, and at the same time the same value and distribution of the distance apart of the bracts, it is highly probable that the two hops are identical, though no definite pronouncement as to origin can be made from this.

1223

GREAVES, J. E. and STEWART, R. **Distribution of the Nitrogen of Wheat between the Flour, Bran and Shorts.** — *The Journal of Agricultural Science*, Vol. IV, Part 4, pp, 376-379. Cambridge, June 1912.

United States: Utah

In the course of investigations conducted by the chemical department of the Experiment Station of Utah on the milling qualities of wheat, data were accumulated with reference to the distribution of the nitrogen between the various products of wheat milling. These particulars are of practical importance with a view to the valuation of the wheat itself and its products.

From a series of 222 determinations carried out on 42 varieties of wheat, the following conclusions of general moment are deducted, the figures indicating the percentage in relation to dry matter:

The percentage of nitrogen in wheat is no direct index of that in the corresponding flour, and in point of fact the percentage of protein remaining in the flour varied from 56.84 to 65.56 of that contained in the original wheat ; while that in the bran varied between 25 and 32.77, and in the shorts from 8.90 to 10.82. As a general average the protein of wheat was divided between the flour, bran and shorts in the proportion of 61.87 %, 27.98 % and 9.92% respectively.

1224

GALLI, E. and CERADINI, A. **Diastase in Bread making.** (La diastasi nella panificazione). — *Rendiconti del R. Istituto Lombardo di Scienze e Lettere*, Serie II, Vol. XLV, fasc. X-XI, pp. 546-555. Milano, maggio 1912.

Italy

In bread-making, in order that the fermentation be successful it must be normal, energetic and well conducted. The addition of brewer's yeast or of alcoholic ferment much more active than bread leaven, allows of a more rapid and complete fermentation. But side by side with alcoholic fermentation, an intense diastase action is necessary to complete useful action during fermentation itself and during the subsequent process of baking.

The authors have therefore thought that the addition of a good preparation rich in diastase would be useful in the process of bread-making. They made use in their experiments of diamalt, endeavouring also to form an idea of the utility of these diastatic ferments expressible in figures.

The chemical composition of the diamalt used by the authors is the following:

	%
Water	30.00
Ash	1.26
Acidity, as lactic acid	0.97
Carbohydrates, as maltose	57.51
Proteids (N. 0.76)	4.75
Dextrins	6.46
Phosphorus	0.15

The addition to flour of such a product cannot fail to improve the composition of the dough and to render it more suitable to bread-making, especially owing to its diastatic power. The determinations of the latter carried out according to A. Pollak's method adapted by the various diamalt factories existing everywhere in Europe, show that diamalt may be considered as a product having a constant composition and comparable effects.

As for its power of causing fermentation, it was determined by comparative fermentation tests in glucose media with: 1.— dough leaven; 2.— brewer's yeast; 3.— mixture of leaven and diamalt; 4.— mixture of brewer's yeast and diamalt; and lastly two other fermentation tests with diamalt and leaven without glucose.

The diminution of weight caused by the development of free carbonic dioxide could be considered as a quantitative index of the effected fermentation.

The results of these comparative investigations were:

1. The diamalt assists the action of leaven and hastens alcoholic fermentation.

2. That diamalt itself is a nourishing medium for ferments.

3. That the action of diamalt in alcoholic fermentation is always the same whichever be the ferment that causes it.

This preliminary theoretical study encouraged the authors in their idea to make practical decisive experiments in the fermentation and baking of bread; 55 lbs of flour were worked up each time and the dough was divided into two portions, to one of which diamalt was added in the portion of 6.5 per 1000 parts by weight of dough.

After baking it was found that:

a) The bread with diamalt had a golden coloured crust while the colour of the other loaves was paler.

b) The bread with diamalt had a greater volume than the one without.

c) The bread with diamalt looked softer, having undergone a more complete and uniform fermentation than the other.

d) The bread with diamalt was crisper, better baked and had a most agreeable aromatic taste.

PLANT DISEASES.

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

1225

Prefect's Decree in the Department of Marne, France, making it Obligatory to Destroy the Moths of Pyralis and Cochylis by Lamp-Traps. (Arrêté préfectoral rendant obligatoire la destruction des papillons de Pyrale et de Cochylis par les pièges lumineux). — *Le Progrès agricole et viticole*, 29e Année, No. 23, pp. 732-733. Montpellier, 9 juin 1912.

The Prefect of the Department of Marne, under date of the 27th April 1912, has decreed as follows:

France: Marne

"Clause 1. In the communes of Avize, Cramant, Janvry, Germigny and Le Mesnil-sur-Oger, the vineyards of which are invaded by Pyralis and Cochylis, and where syndicates of vine-growers exist organised for the defence of the vine against its parasites by means of lamp-traps, control measures are made temporarily obligatory."

"Clause 2. Every owner of vines in these communes is bound, in 1912, to dispose lamp-traps on his property in proper time at the rate of one lamp to every 5 ares (8 per acre)."

"Clause 3. The territories to be controlled in each commune shall be demarcated by a Commission of 10 members, nominated by the mayor and selected by the members of the syndicate. The list of territories shall be brought to the knowledge of the owners of the land by means of notice posted up at the Town Hall before the 1st June."

"Clause 4. The lighting of the lamps must be begun as soon as the presence of Pyralis moths or the second generation of Cochylis is observed in the commune. Such observation shall be recorded by means of indicator lamps erected in proper time; on and after the 15th June 1912, by the Entomological Station of Châlons-sur-Marne. Notice hereof shall be given to the Mayor, who shall immediately have public announcement thereof made with drum-call."

"Clause 5. The lighting of the lamps shall cease when the Entomological Station of Châlons-sur-Marne thinks fit. Notice of the decision shall be given to the Mayor, who shall immediately have public announcement thereof made with drum-call."

"Clause 6. The measures against moths in 1912 may be suspended on the proposal of the Entomological Station of Châlons-sur-Marne in the event of the parasites having disappeared. Notice of this decision will be given to the Mayor, who will immediately have public announcement made thereof with drum-call."

"Clause 7. In the event of refusal on the part of the vine owners to comply with these regulations, articles 77 and 78 of the law of rural police of the 21st June 1898 shall be applied to them."

"Clause 8. The Sub-Prefects, Mayors, Rural Police, etc., are entrusted with the execution of the present decree."

The said decree was approved by the Minister of Agriculture on the 15th May 1912.

1226 **The Protection of Cultivated Plants and Agricultural Propaganda in Uruguay according to the Law of October 21, 1911 and the Regulations of March 19, 1912.** (Defensa Agrícola. Reglamentación de la Ley sobre defensa agrícola). — *Rivista de la Asociación Rural del Uruguay*, Año XLI, No 1, pp. 34-37 and No 5, pp. 372-377. Montevideo, Enero-Mayo de 1910.

Uruguay

The above law orders the institution of a central Commission for the protection of cultivated plants (Comisión Central de Defensa Agrícola) composed of landowners and experts, and intended to assume the duties imposed on other officials by the rural code and by special laws concerning the pests which affect agriculture, and in general to take all necessary steps to prevent or repress the invasion and spread of injurious plants or animals (articles 1 and 2).

The executive is charged to settle the nomenclature of injurious plants and animals as well as — until a game law shall have been enacted — that of those animals considered useful for the protection of plants and whose destruction will be prohibited (art. 3).

The executive is empowered to forbid the importation of seeds, plants, manures etc. which might favour the spread of pests (art. 4).

In fixing the constitution of the Defensa Agrícola it is ordered that the district inspectors might be called upon — when their other duties allow it — to assist in agricultural propaganda (art. 6).

The destruction and sale of small birds not injurious to crops and the destruction of their nests is forbidden at all periods of the year (art. 16).

The regulations annexed to the above law consider (art. 1-7) the constitution and the duties of the Comisión Central de Defensa Agrícola (including the annual publication of a memoir containing technical and administrative information on the institution); the duties of the director, of the district inspectors, of the section inspectors (these latter must complete the intelligence service and inspect the sections entrusted to them by the district inspector), and the duties of the selection commissions. Concerning the third art. of the Law, art. 7 of the Regulation says: The following are declared pests of agriculture: the locust (langosta), the large black ant (hormiga negra grande), the coloured ant (hormiga colorada), *Diaspis pentagona*, the " vaguilla " or " bicho moro " (1), the bicho de cesto " or " canastillo " (2), the " liebre " and the " lagarta " (3).

If necessary, the Central Commission may propose to the executive the extension of this list and, in consequence, the adoption of all those measures tending to the destruction of pests. For the control of injurious plants or animals that the Defensa Agrícola does not designate as pests practical advice will be given. Concerning each pests the Direction will give special instructions and will be free to take all steps tending to their destruction, such as: applying to the authorities for their assistance in enforcing the execution of the Regulations; claiming from the Central Commission the funds necessary for carrying out the work; pointing out to the secretary's office, for publication and diffusion, the means considered most practical and effective for the control of pests; requesting the Central Commission to buy the machines and material required for experiments, the results of which are to be made public.

As regards art. 4 of the Law the importation of seeds, plants or manures likely to favour the development of diseases is forbidden (art. 9. of the Regulations). For the importation of seeds, plants and manures the presentation of a certificate from the general Direction is obligatory.

For the duty-free importation of material or machines intended for the destruction of pests, applications for the necessary permit are to be addressed to the Central Commission. The Direction will adopt those means of control that it shall deem fit (art. 10).

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(1) *Epicauta* spp.: see *B.* July 1911, No. 2350.

(2) *Oeceticus platensis*: see *B.* Feb. 1912, No. 459. (*Ed.*).

(3) Gipsy moth (*Porthetria* [*Liparis*] *dispar*): see *Boletin de Agricultura técnica y económica*, Año IV, Num. 42, p. 527 (Madrid: 30 Junio 1912).

According to art. 11, the importation of seeds, plants, manures and other objects likely to be vehicles for the spread of the pests considered by the present Regulations shall only be allowed at the port of Montevideo — until the Executive authorizes other ports — and subject to the following regulations:

1. For the importation of seeds an application must be made to the Direction of the Defensa Agrícola; it must contain: the name and domicile of the importer, the place of origin of the goods and proof of the truth of the declaration; the object of the importation (sale, sowing or consumption).

2. A delegate of the Defensa Agrícola will take samples of such goods and according to the results of the examination the importation will be allowed or rejected; in the latter case it shall, at the option of the importer either be immediately shipped again or destroyed without the right to any indemnity.

3. Seeds of lucerne or other forage plant containing more than 2 % of dodder will be rejected.

The cleansing of forage plant seeds containing more dodder than the quantity tolerated is allowed. Such cleansing shall take place under the surveillance ordered by the Defensa Agrícola. The impurities after separation shall be burned. The goods will be admitted to the Custom House — with a special certificate — after having been completely cleansed, and only after satisfactory examination of new samples taken from them (art. 4 and 5).

For the introduction of plants, an application similar to that mentioned in paragraph 1 of art. 11 must be made, and the number borne by the licence granted must be stated. The inspection shall be made — when feasible — in the Montevideo Custom House and the certificate granted. Should the plant be found infected, 48 hours are allowed for its disinfection or reshipment or destruction by fire, without right to any indemnity. When the inspection cannot be carried out in the Custom House without danger to the life of the plant the inspection will lake place at the consignee's domicile.

Fruit, vegetables, roots and tubers, etc., liable to be vehicles of infection shall likewise be subject to inspection.

Similar regulations hold good for the importation of manures. The introduction of these will be prohibited if, on analysis, it appears that they have been adulterated.

Art. 12 establishes the fines which will be inflicted for infractions of the above.

Art. 13. is dedicated to the agricultural propaganda considered by art. 6 of the Law.

The district inspectors shall present a scheme for the cultivation of the farms pointed out by the Direction, taking into consideration the natural and economic conditions of the locality and endeavouring to introduce improvements accessible to the average rural conditions of the locality. The general plan shall include an orchard, seed beds, a nursery of fruit and forest trees (if possible) and small rural industries. The proceeds from the sale of the produce shall be devoted to the improvement of the farm. Accounts shall be kept in the model farm and lectures shall be held, and practical lessons given.

According to art. 14 every landowner, lessee, occupier or contractor of farms that possess plantations of trees likely to favour the development of parasites, must inform the Defensa Agrícola of the fact and give notice to the nearest delegate of this body of every infection or suspicion of infection.

The Defensa Agrícola by means of leaflets shall communicate the best methods for the prevention and control of parasitic plants. The employés of the Defensa Agricola shall have free access to all the farms; should they discover a parasitic disease they shall inform the owner, who must take steps for its destruction within 48 hours. Failing to do so he incurs fines; and the destruction will be undertaken — at his expense — by the Defensa Agrícola.

In cases of notorious and justified poverty the respective authorities will refund the expenses incurred, availing themselves of the funds at their disposal for this object (art. 12 of the Law).

The exportation of plants from an establishment considered to be infected is forbidden; but if in a nursery but a few infected plants are found, only their destruction, in the presence of an inspector, will be required. An indemnity in money will be granted to those owners whose woods have been destroyed in order to avoid the propagation of parasites which by themselves would not have caused the destruction of the woods.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

VASILIEFF, E. **Injury to Beets by Frost.** (Bericht über die Fortschritte im Rüben- und Rübensamenbau Russlands). — *Blättre für Zuckerrübenbau*, XIX Jahrg., Nr. 10, pp. 153-155. Berlin, 31. Mai 1912. 1827

Russia

In the Report for 1911 of the Entomological Station of the Government of Kiev, E. Vasilieff studies the action of frosts on beets. He examined the action of a night frost of 2° C. (3.6° F.) which on the 5th May 1911, in the Government of Voronezh, fell upon recently sprouted beets having only the seed-leaves. The night frosts did not injure the whole of the field, but only single plants here and there. The percentage of injured plants ranged from 8 to 12 according to their location in the field. Most ravaged by the frost was a part of the plot of land lying very low, where about 53 % of the beets perished. The intensity of the injury was variable and the four following phases could be distinguished:

1. Alteration of the two seed-leaves (cotyledons), in consequence of which one or both withered and assumed a dark hue.
2. Alteration of the seed-leaves and the bud contained between them, which produces the second pair of leaves.
3. Alteration of the seed-leaves, the bud and the upper part of the stem.
4. Alteration of all the parts of the young plant above ground.

The underground part of the stem and the root in each case remained uninjured, the injury proceeding from above downwards. The seed-leaves were the organs most frequently injured, because, having relatively extensive surfaces in a horizontal position, they more readily undergo loss of heat. This phase is, however, not fotal when the bud at the apex remains uninjured. The death of the latter takes place much more rarely, because it is enveloped as in a sheath by the seed-leaves. The death of the apical bud is generally accompanied by an alteration of the upper part of the stem, by which the whole of the young plant above ground shrinks and shrivels and the plant perishes.

When recourse is had to re-sowing, it is requisite to determine the percentage of the plants damaged, which is most expediently carried out on the first and third day after the frost.

As the operation of singling extirpates more than 90 % of the plants, the effects of frost are much less evident in point of quantity than those of that operation; in point of fact frost kills at most little more than 50 % of the plants.

In the case of beet for seed, the frost only acts on the horizontal outside leaves, the inside ones remaining unaffected. It sometimes happens that the inner leaves, in consequence of a frost, assume a whitish colour (owing to a local arrest of the formation of chlorophyll) which imparts to the plants attacked the appearance of those suffering from albinism. After a couple of weeks however this condition disappears, leaving no trace.

1228 CHANCRIN, E. **Action of Nitrate of Soda and Sulphate of Iron in Cases of Chlorosis of the Vine** (1). (La chlorose de la vigne. Action du nitrate de soude et du sulphate de fer. Les engrais catalytiques). — *Journal d'Agriculture pratique*, 1912, Tome I, No. 22, pp. 683-686 et No. 23, pp. 715-716. Paris, 30 mai-6 juin 1912.

France: Burgundy

In 1911 many vineyards in Burgundy sustained more or less damage from chlorosis, a disease generally attributed to the presence of limestone in the soil. According to the Author, limestone is the principal cause of chlorosis but not the only one. He holds that the vine, similarly to other plants (cereals, roses, fruit trees, etc.) becomes chloritic whenever, for one reason or another, its nutrition is bad. It is mostly lime which, brought into a state of solution by rain, hinders the nutrition of the entire stock; sometimes it is stagnant water which prevents part of the roots from breathing and consequently stops their functions; at other times again it is phylloxera which, killing off some roots, renders good nutrition of the stock difficult. An excess of moisture, phylloxera, etc., act incidentally and temporarily; limestone on the contrary, in the soils containing it, exerts a constant action.

In 1911 the rains, being insufficient, did not bring about the appearance of chlorosis in the vines owing to the solution of the limestone. The principal cause of the disease was the imperfect lignification of the branches in 1910 owing to the attacks of peronospora (mildew); the limestone also acted as a secondary cause.

The Author suggests spraying or watering the vines with sulphate of iron, warning the grape growers, however, that this remedy would very likely prove insufficient and that it would be more desirable to spread nitrate of soda at the rate of 2 cwt. per acre. The first gentle rain would dissolve the nitrate and bring it into contact with the roots. To the nitrate, sulphate of potash may be added ($^{3}/_{4}$ to 1 ¼ cwt. per acre).

In reality, sulphate of iron did not give good results, while nitrate of soda proved fairly effective against chlorosis, as appeared among others from the trials carried out by the Author in the vineyard of the School of Beaune and by others at Nantoux, near Pommard, and at Volnay. At Nantoux, although only $^{3}/_{4}$ cwt. of nitrate was used, the vines gradually resumed their usual green aspect, while the neighbouring vines not subjected to the experiment showed that they were suffering considerably.

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(1) See also *B.* March 1912, No. 573. (*Ed.*).

Assuming that chlorosis is always an effect of malnutrition of the plant, whatever the cause, how can we explain the action of sulphate of iron incorporated in the soil, above all in the form of a solution, on the leaves and pruned surfaces? The Author thinks that the action of sulphate, on the vine specially, is of the same category as the action of catalytic fertilisers on the nutrition and the development of the plants. The term catalytic fertilisers is applied to certain chemical substances which, added in small doses to the soil and also introduced into the plants (through the pruned surfaces of the vine) give rise to profound modifications of vegetation without appearing to intervene directly as plant food. Their ction is indirect and as yet little known.

The process of chlorosis and the action of sulphate of iron thereon are two questions for the settlement of which fresh studies and fresh investigations are essential.

1229 VERCIER, J. **Summer Treatment with Sulphate of Iron for Controlling Chlorosis of the Vine.** (Contre la chlorose de la vigne. Un essai de badigeonnage d'été au sulfate de fer). — *Le Progrès agricole et viticole*, 29e Année, No. 23, pp. 713-714. Montpellier, 9 juin 1912.

France: Côte-d'Or

In an orchard at Lantenay (Côte-d'Or) a large number of vine stocks in 1911 appeared severely attacked by chlorosis. The stocks were very much withered, completely yellow and almost dying. This being the case, the Author on the 16th June decided to make trial of the action of sulphate of iron on a number of them. After cutting away the two or three poor branches existing (which then no longer possessed more than two or three leaves, or rather two or three internodes) at 14 to 16 in. from the ground, *i. e.* 8 in. from their point of origin, the cut surface was immediately coated by means of a brush with a solution of sulphate of iron of 30 % strength (3 lbs. to 1 gallon of water). The operation was therefore identical with what is indicated in autumn, a few days after the grapes have been gathered; the only difference is the herbaceous condition of the branches and the length left on each of them.

Although at first sight it would seem that the sulphate of iron made its way deep into the tissues of the cut ends of the branches, eight days afterwards the branches began to grow green, and after another eight days the buds they carried and the few leaves at the base had become almost completely green. Of the

35 stocks of Gamay and Pinot subjected to the experiments, two were dead and three remained yellow.

It was then decided to extend the treatment to the other stocks, about 200. As however in the meantime 15 days had already elapsed and the hot weather had set in, the diseased stocks were now dying and several of them already dead. The survivors gave partial and rather poor results. The stocks of the first experiment on the contrary continued to gain strength; leaves and young branches multiplied normally. On the fall of the leaves it was easy to observe the perfect lignification of the branches treated with sulphate of iron, which in the meantime had grown. Cutting was easily carried out in March on the 30 surviving stocks of the first experiment, but it was a delicate and often a useless operation for the greater part of the other vines treated late, the majority of which perished.

BACTERIAL AND FUNGOID DISEASES.

BACTERIAL DISEASES.

TRZEBINSKI, I. **Bacterial Diseases of the Roots of the Beet.** (Bericht über die Fortschritte im Rüben- und Rübensamenbau Russlands). — *Blätter für Zuckerrübenbau*, XIX. Jahrgang, No. 10, pp. 154-155. Berlin, 31. Mai 1912. **1280**

Russia

In the Annual Report of the Entomological Station of the Government of Kiev, I. Trzebinski publishes his studies on the bacterial diseases of the roots of the beet, and arrives at the following conclusions: 1) Bacteriosis of the beet takes two forms in the south-west Governments: dry rot ("Trockenfäule") and wet rot ("Nassfäule"); in the latter case the root tissues are transformed into a slimy mass. 2) The two forms of the disease are produced by the same bacterium. The wet rot is likewise attended by special bacteria, which convert the tissues into slime and are also to be found in the black stripes of the leaves. 3) Both forms of bacteriosis may begin from the tail of the root, from the sides, or from the dying crown. All these symptoms may be found simultaneously in a single root. 4) If all the buds of the crown die, the root either perishes or forms new necks, from which fresh roots originate downwards, more or less separated from the original root. They thus become more or less fanged. 5) The death of seed beet in the field is largely a consequence of the bacterial diseases which begin in the clamp. 6) Such diseases may however also begin after the beets have been planted out, and in that case the death of the tissue is brought about by mechanical injuries on the roots which allow of the entry of the pathogenic bacteria. 7) The disease spreads from the diseased to healthy roots over or through the soil, if the diseased root is left or planted in the latter. 8) The removal of the tails of the diseased roots, cutting back to the healthy tissues before clamping, somewhat diminishes the intensity of the disease. 9) The use of nitrate of soda increases the bacteriosis; superphosphate alone reduces it. 10) The treatment of the roots before clamping with solutions of formalin of ½ or 1 % strength, or pouring this over the roots after heaping them, intensifies the disease. 11) Treatment of the roots with a watery solution of carbolic acid of ½ % strength, or a 2 % solution of sulphate of copper reduces the number of diseased roots.

FUNGOID DISEASES.

1881 RANT, A. **The Disease "Djamoer Oepas" and *Corticium javanicum.*** (Ueber die Djamoer-Oepas-Krankheit und über das *Corticium javanicum* Zimm.). — *Département de l'Agriculture, de l'Industrie et du Commerce aux Indes Néerlandaises, Bulletin du Jardin botanique de Buitenzorg,* 2ᵉ Série, No. IV, pp. 1-50, fig. 1-14. Buitenzorg, 1912.

Java The name "Djamoer Oepas" (poisonous fungus) is given to the "Pink disease" which attacks Dicotyledons and Gymnosperms, and which is caused by a Basidiomycete, *Corticium javanicum* Zimm. The name "Djamoer Oepas" has also been applied to other diseases, which have been observed on some Monocotyledons (*Saccharum officinarum* L., *Oryza sativa* L., *Marantia arundinacea* L., *Rottboellia exaltata* L.), but which are due to other fungi. A disease which especially attacks coffee and is called by Zimmermann "Spinnengewebekrankheit", also goes by the appellation "Djamoer Oepas".

Zimmermann and the writer have hitherto found *C. javanicum* on 141 species of plants belonging to 104 different genera.

Two cases of immunity mentioned by the writer should be noticed, one a small epiphytic fern, very common in Java, *Drymoglossum heterophyllum* C. Chr., the other *Ipomoea Nil* Roth (= *I. hederacea* Jacq.). Both these plants, although covered with the fructifications of the fungus, appeared to be healthy. *Lantana Camara* L. proves also fairly resistant to the disease. Resistance varies between different species and even between individuals of the same species. *Corticium* is often accompanied by another fungus, *Necator decretus* Massee.

The disease "Djamoer Oepas" has been observed, not only in Java (1) but in Sumatra, at Sarawak (Borneo), in the Straits Settlements, in Ceylon, in Kamerun and in the Caucasus.

The writer studied it especially on species of *Cinchona* (*C. Ledgeriana* Moens, *C. robusta* Trimen — probably a hybrid from the cross *C. succirubra* Pav. × *C. officinalis* L. — and *C. succirubra*). On these species he found the following fungus forms: *a*) a whitish or pink crust often a little fissured, developed on the lower portion of the lateral branches, and upon dead leaves, fruit-bearing branches and fruits; this is the fructification of *Corticium*; the tissue below the crust appears nearly always dead; below the fructifications, a red larva probably belonging to the Diptera, is sometimes found; *b*) small white spots, or pustules, connected on the branches by fine interlacing hyphae; these formations are produced by a mass of hyphae, which usually extrude from lenticels; *c*) a mycelium, often silvery white in colour, which winds about the branches and resembles a spider's web; *d*) fructifications of *Necator* of a pinkish orange, which occur in occasional crevices of the bark of the branch.

On the trunks and branches, *Corticium* and *Necator* can be found together; on the lateral branches *Necator* occupies the upper and *Corticium* the lower part. In exceptional cases, *Necator* and *Corticium* are found on the same branch; but the tree is no less persistently attacked also by *Corticium*. From inoculation experiments on *Cinchona* with forms of the fungus "Djamoer Oepas" found on the same *Cinchona*, the writer concludes: *a*) that the spider-web formed of mycelium and the pustules both belong to the life-cycle of *Corticium*; *b*) that *Necator* and *Corticium* represent two forms of fructification of the same fungus; *c*) that the fungus of "Djamoer Oepas" can be conveyed from one species of *Cinchona* to another.

After having proved that *Necator* and *Corticium* are fructifications of the same fungus, the writer, in his subsequent inoculation experiments, used either form indiscriminately.

Then, in order to solve the question whether this fungus gives rise to biological or elementary species, he divided into two series his other inoculation experiments on *Cinchona* with the fungus of "Djamoer Oepas" developed upon other host-plants. In the first series, he made use of material from *Coffea arabica* L., *Thea assamica* J. W. Mast., *Grevillea robusta* A. Cunn., *Lantana Camara* L.;

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(1) See *B*. June 1911, No. 1917. (*Ed.*).

Ficus cuspidata Reinw., etc., and growing in the same district as the *Cinchona* to be inoculated. The results of these experiments showed that, with the exception of one individual found on *Lantana Camara* and *Ficus cuspidata*, all the fungi collected from *Cinchona* and from the other plants belonged to one and the same elementary species; that the genus *Corticium* includes no biological species; and that it seems most likely that *Corticium* and *Necator* are the fructification forms of the same fungus.

For the second series of inoculation experiments on *Cinchona*, the material was collected in Java on the following plants in the localities indicated for each: *Coffea stenophylla* G. Don (at Buitenzorg); *Thea assamica* (at Paroengkoeda); *Hevea brasiliensis* Muell. Arg. (at Pasir Kenanga near Soekaboemi and at Tjirandji); *Coffea abeocuta* Cramer (at Salatiga); *Theobroma Cacao* L. (at Ambarawa, at Kendal and at Wlingie near Blitar); *Myristica fragrans* Houtt. (at Wlingie near Blitar), etc.

From his investigations, the writer concluded that *Corticium* from other districts of Java possessed the power of infecting the *Cinchona* trees of Tjinjiroean near Bandoeng; but to a much less extent than the fungus on the plants of the same locality.

Another question to be studied is whether the fungus, in exchanging one place for another, becomes more virulent to the *Cinchona*. The artificial cultivation of *Corticium* for three years showed that its toxic properties diminished; but the investigator was not able to determine whether the poisonous character of the fungus is lost, or increases, from inoculation on *Cinchona*.

The researches showed the different forms which the disease assumed. Thus, in the inoculation of *Cinchona* with *Corticium* from *Theobroma Cacao* and *Myristica fragrans* at Wlingie, instead of the usual *Corticium* fruit, which is habitually found on *Cinchona*, a luxuriant growth of *Necator* nearly always ensued. With *Necator* from *Thea assamica* at Paroengkoeda, on the contrary, after 100 inoculation experiments, there was no sign of *Necator*.

On the other hand, it seems from the experiments, that, as a rule, the same elementary species of the fungus make their appearance on different species of plants in the same district; while different elementary species of the fungus are found on the same species of plants in different localities.

The writer is of opinion that predisposition on the part of the plant is the first factor in the appearance of the disease; beside this cause he places humidity, which he considers under three forms which act separately or together, *viz.* humidity of the air, the inherent moistness of the plant's nature, the water content of the organs of the plant (this latter form, however, has but a feeble influence).

It appears that the dead portions of the branches also serve to spread the disease. The fungus, which at first lives upon the organs merely as a saprophyte, can easily penetrate into the tissues of the plant by means of the solutions existing in the dead parts of the branch. Often young *Cinchona* trees are attacked by "Djamoer Oepas" as a result of injuries sustained from *Helopeltis Antonii* Sign. Shade and the nature of the soil are other factors which can predispose plants to the disease.

As a good method of direct control, the writer recommends the removal and burning of all infected parts of the plant. Anticryptogamic preparations have not given durable results.

He further considers the indirect or prophylactic measures. Little or nothing can be done to remedy the humidity of the air. In choosing the site of a plantation, however; attention should be paid to the meteorological factors (mist, rain) although this is a difficult matter in the case of extensive cultivations like those of the tropics. It is also well to avoid close planting as much as possible.

All animal enemies which enfeeble the trees by their attacks must be energetically combated.

Further, a careful selection of the plants to be cultivated can do much towards the control of the disease.

In conclusion, the writer describes the various methods he has adopted in studying the fungus under discussion.

MANGIN, MAURICE. **Contribution to the Study of the "Rond" Disease of the Pine** (1). (Contribution à l'étude de la maladie des Ronds du Pin). — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, Tome 154, No. 23 (3 juin 1912), pp. 1525-1528. Paris, 1912. **1282**

France: Fontainebleau

This disease, which is pretty frequent, especially in France and Germany, has been regarded up to now as being produced by a parasitic fungus, *Rhizina inflata* (Schaeff.) Sacc. (2), the mycelium of which, vegetating on the roots of the pines and other conifers, finally causes the death of the trees attacked.

It had till now also been supposed that the disease starts all round those points in the forest in which fires have previously been ignited, and that it is never manifested in good soils or plantations where the resinous species are intermixed with broad-leaved trees.

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(1) See *B.* Nov. 1910, p. 166; Dec. 1910, p. 353. *(Ed.)*.

(2) A synonym of *Rhizina undulata* Fr. Cf. ED. PRILLIEUX: *Maladies des plantes agricoles*, T. II, p. 460. Paris, 1897. *(Ed.)*.

In enquiries set on foot in the domainal forests of Fontainebleau, injured in the summer of 1911 by violent fires, the Author was led to the conclusion that *Rhizina inflata* is a common fungus at Fontainebleau at all points where there are pines planted on sandy soil. The presence of the fruit-bearing bodies of the fungus is more or less conspicuous according as its development is more or less promoted from the point of view of nutrition by the ashes of spontaneous fires or of those lit by the forest keepers, whatever the state of the forest plantation. Under these circumstances the Author thinks it difficult to assume that the " Rond " disease is produced by an invasion of the roots of the trees by the mycelium of the fungus. Such invasion does really take place, but it is subsequent to the withering of the tree under the attacks of the " Rond " disease, the cause of which is still unknown.

1233 ***Isaria Psychidae*, a Fungus parasitic on " Wattle Bagworms " (*Euneta* sp.), which attack *Acacia mollissima*.** — See below, No. 1241.

RESISTANT PLANTS.

1234 **Selection of Rust-resistant Wheats.** — See above, No. 1154.

MEANS OF PREVENTION AND CONTROL.

1235 **Control of *Hemileia vastatrix* in the Coffee-Plantations of New Caledonia.** — See above, No. 1127.

1236 WEINMANN, J. **Wetting Fungicides.** (Bouillies mouillantes). — *Le Progrès agricole et viticole,* 29e Année, No. 23, pp. 709-712. Montpellier, 9 juin 1912.

France With the intention of determining the formula or formulae most useful for fungicidal preparations, especially from the point of view of reducing surface-tension, the Author in collaboration with others, conducted last winter a series of investigations in reference to copper mixtures of different compositions. The laboratory enquiries were supplemented by sprayings on vine leaves from the very beginning of vegetation. From these experiments it is clearly evident that preparations with a base of copper and including alkaline polysulphides and soap, are far superior in regard to their covering power to all others.

Sapindus powder, used with carbonate of copper ("bouillie bourguignonne"), without polysulphides, has a wetting power almost equal to that of soap. Nevertheless *Sapindus* powder is much inferior to soap in copper mixtures combined with polysulphides.

The soap of sodium oleate in powder, which is specially sold for remedial mixtures, is not more effective in regard to covering power than the ordinary white Marseilles soap. The addition of polysulphides alone (without soap) to the carbonate of copper does not increase the wetting power; but the addition of polysulphides and soap to carbonate of copper, neutral or alkaline, produces by far the best result from the point of view of wetting.

Among the various formulae tried, the Author after carrying out experimental trials, gives preference to the following:

a)	Carbonate of copper	23 lbs.
	Alcaline polysulphides	5 lbs.
	White Marseilles soap	5 lbs.
	Water	100 Imp. gallons.
	(Wetting power: 223 drops with the Duclaux pipette).	
b)	Carbonate of copper	23 lbs.
	Alcaline polysulphides	5 lbs.
	White Marseilles soap	10 lbs.
	Water	100 Imp. gallons.
	(Wetting power: 260 drops).	

VIDAL, J. L. **Subsequent Influences of the Quality of Mixtures used for Mildew on the Vigour and Production of the Vine and its Resistance to Chlorosis.** (Les suites du Mildiou. Influences lointaines de la qualité des bouillies sur la vigueur, la production et la résistance à la Chlorose). — *Revue de Viticulture*, 19^{e} Année, Tome XXXVII, No. 965, pp. 813-818, fig. 104-105. Paris, 13 juin 1912. **1287**

In 1910 experiments were begun with different spray-mixtures on a part of the experimental vineyards of Marsville, belonging to the Cognac Viticultural Station. This area, occupied since 1902 by Folle Blanche vines grafted on 41 B, has, within the memory of the Author, never been attacked by chlorosis. The soil, homogeneous, contains 50 % of carbonate of lime. The vegetation was likewise homogeneous in 1909. **France**

All the sections were treated equally and almost in the same period of time. At the end of August spraying was suspended.

The experiments confirmed the fact that the mildew exercises various remote influences on the vine: reduction of the strength of resistance to chlorosis, enfeeblement of vegetation, and diminution of productivity. These influences are quite pronounced and in a way proportional to the damage produced by the mildew at a given time. They may in a single year result in the complete perishing of the stocks. In case of invasion by mildew at different times, the early damage has the most disastrous influence on the future life of the vines assailed.

From the experiments carried out the Author arrives at the following practical conclusions:

1. It is necessary to protect the foliage of the vine with the utmost possible care even when the grapes have not formed and there is no hope of an immediate crop.
2. The invasions of mildew, even when light, react on the future of the vineyard; control measures against these attacks which appear sufficient to save the existing crop may not suffice to ensure the safety of future crops.
3. It is needful to give particular care to the first copper sulphate treatments, because at that time the absence of the leaves may entail very serious consequences; it should not be inferred from this, however, that late measures are useless.
4. Very careful likewise must be the selection and preparation of the spray-mixtures.
5. In the quality of a spray-mixture two requisites must be distinguished: immediate efficacy and the duration of activity; this latter point serves for determining the number of treatments to be made.
6. In the cases of reconstitution of vineyards on calcareous soils, the possibility must be allowed for, in the course of the existence of those vineyards, of more or less serious attacks by mildew, which involve a further notable diminution of the limits of resistance of the grafted stocks to chlorosis. This furthermore constitutes, in respect of these soils, another reason for devoting care to the control of the mildew.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

VOGLINO, P. **Some Diseases of Kitchen-Garden Crops and Flowers in Liguria.** (Sopra alcuni deperimenti di colture ortensi e floreali della Liguria). — *Giornale di Agricoltura della Domenica*, Anno XXII, No. 24, p. 189. Piacenza, 16 giugno 1912. **1288**

Italy: Liguria

During a recent excursion in Liguria, the Author had occasion to observe that the kitchen gardens and flower beds there, although improved in a noteworthy degree, nevertheless have to contend against a large number of cryptogamic parasites.

The tomato is attacked by *Phytophthora infestans*, *Bacillus Solanacearum* and *Cladosporium fulvum* var. *violaceum;* the last named, which in 1879 was found to cause great ravages to tomatoes in America and was again encountered in 1890 in the north of France, attacks in Liguria plants forced in the houses.

In the houses the young cucumbers are likewise severely attacked by *Scolecotrichum melophthorum*, which is extending to several other Cucurbitaceae: it has been found on cucumber and melon in France, and is now attacking pumpkin. The control of the parasite is difficult; on sowings in mud artificially infected a good result was yielded by sulphate of copper (3 %) scattered at the base of the young plants.

The Author has also found *Bremia Lactucae* fairly widespread on lettuce and artichoke. Brocolis are attacked by *Polydesmus exitiosus*, and young onions by *Peronospora Schleideni*.

Finally, on carnations the Author has found in abundance *Heterosporium echinulatum*, *Ascochyta Dianthi*, *Uromyces caryophillinus*, a *Botrytis*, a *Fusarium* and acarids. Against *Heterosporium* it is advisable to repeat frequently, from the first growth of the plants, spraying with sulphate of copper. It would be advisable to replace the ordinary lime mixture by that of sodium carbonate and soap in a proportion of 1 %, because it sticks to carnations much better. Against *Ascochyta*, which floriculturists confuse with the foregoing, and which is perhaps still more injurious, the destruction of the plants attacked may be resorted to. The *Botrytis* may be controlled by repeated sprayings on a basis of sulphate of copper, carried out on the young plants in boxes and on the flowers of individuals already well grown. With regard to *Fusarium*, resort must be had to early sprayings with sulphate of copper as indicated above, adding however 1 % of tobacco extract to keep the acarids away.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

1239 Poli, Polo. **The Control of Weeds in Rice Fields** (1). (La lotta contro le erbe infeste). — *Il Giornale di Risicoltura*, Anno II, No. 11, pp. 164-166. Vercelli, 15 giugno 1912.

Italy

From the end of May till the end of June, the rice-growers are especially occupied with the control of weeds, which hinder the development and the bearing of the rice plants by growing luxuriantly at the expense of the latter and with the help of the good soil and fertilizers prepared for the rice crop.

The only efficacious remedy consists in thoroughly cleaning the fields and uprooting all the weeds which can be found at the time. Later, it is necessary to examine the soil, lest any of the weeds which are still growing amongst the rice, having escaped the first time owing to their small size, should fructify and scatter their numerous seeds. Usually the weeds, when up-rooted, get piled up in the furrows; these masses should be stirred, in order that they may decay and not fructify· The margins and the embankments are often inhabited by many plants which are injurious to the rice-fields; these plants afford good forage for the thrifty animals on the rice farms, replacing straw, which is often the only forage they are given.

INSECT PESTS.

GENERALITIES.

1240 Silvestri, F. **An Account of *Rhynchites ruber*, a Pest of the Olive.** (Contributo alla conoscenza del Rinchite dell'olivo [*Rhynchites ruber* Fairm.]). — *Bollettino del Laboratorio di Zoologia generale e agraria della R. Scuola superiore d'Agricoltura in Portici*, Vol. VI, pp. 151-170, figg. I-XIII. Portici, 1912.

Italy: Apulia

From 1910 to 1912 the writer has carried out at Leucaspide, near Taranto, a series of investigations on *Rhynchites ruber* Fairm. (known in Italy under the name of " Rinchite dell'olivo " and called in the Apulian dialect " Punteruolo "), syn. *Rh. cribripennis* Desbrochers and *Rh. ruber* var. *cribripennis* Schilsky. This beetle, which was first described in 1859 from a specimen coming from Constantinople, was subsequently found in Corsica, in Malta and in Italy (Calabria, Apulia, Sicily and the coast districts of Tuscany), where, in 1878, Licci mentions it for the first time as being injurious in the province of Lecce.

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(1) See *B.* Feb. 1911, No. 675; May 1911, No. 1555; June 1911, Nos. 1934-1935; Feb. 1912, No. 429; June 1912, No. 981. (*Ed.*).

Having given a systematic description of the adult beetle, the eggs, the larva and the pupa, the writer gives the life-history of the insect. The adults begin to make their appearance towards the end of April, and until the olives are formed, they feed upon the parenchyma of the small terminal leaves in process of growing. These organs, although they do not show much sign of damage from their attacks, become more or less deformed and are sometimes perforated. At other times, the pest attacks the terminal internodes of the young shoots, excavating holes of various depths; in these cases the whole of the shoot above the hole or holes dies.

It also destroys the apices of new terminal shoots, doing much damage before injuring the fruit.

After the leaves, *Rhynchites ruber* turns its attention to the fruits, beginning with those which are scarcely formed; in these it makes a puncture, which appears like a small hole surrounded by a sub-circular spot. Until the olives attain a length of 7 to 8 mm. and a diameter of 3.6 to 4 mm., the insect attacks and sucks the seed which is forming, with the result that the fruit dries up and falls. This the writer observed in 1911 up to about July 10th.

Afterwards, being no longer able to get at the seed, the beetle pierces the sarcocarp to obtain food and only makes a hole in the wall of the stone, in order to deposit its eggs.

The deposition of the eggs begins about the middle of July and continues to the first days of August, coinciding with the passage of the stone from a soft to a woody condition. The females close up the hole made in the sarcocarp with fragments, but often the tissue grows round the hole and thus closes the cavity. Eight or ten days after the eggs are laid, the larvae hatch out; they begin to devour the wall of the stone, which separates them from the kernel; when they reach the latter, they gnaw it partly for food, and partly to prepare themselves a shelter.

Towards the end of September, the larvae begin to attain their complete development, but most of them become adult and leave the olives in October and November, or even as late as April of the following year. The adult larvae, in order to escape from the fruit, make a hole in the wall of the stone and find their way through the pulp of the olive. Thence they fall to the ground, and turning round, excavate a sub-spherical chamber within which they complete their metamorphosis. The pupae assume the adult form during winter, or at the beginning of spring.

The injury caused by *Rhynchites ruber* may be considerable and seriously affect the crop. The adult insects can be collected by shaking the trees, beneath which cloths are spread; or they can be gathered at night, or in the early morning, when they are still on the ground; this latter is an excellent method of control, if good and fairly cheap labour can be obtained. The operation should be carried out, first in May, before the olive flowers are open, and again in June after their pollination.

As *Rhynchites* is a powerful flier, in order to have any effect, preventive measures must be undertaken by the owner over a wide area; or by the owners of contiguous estates at the same time. These operations should be followed by collecting the larvae, destroying the fallen olives, from September onwards, and killing the larvae which have taken shelter in the sheds.

In the province of Bari, the cultivators, having observed that olives growing by the roadside and covered with dust, are shunned by *Rhynchites ruber*, have had recourse to using road dust; this practice had some advantages, and was followed by a few persons till 1911. Then, however, owing to its costliness, and the limited supply of road-dust available, it was superseded by dusting with sulphur, adding to the latter substance an insecticide, such as pyrethrum, or even naphthalin.

The experiments so far made, on a small scale, prove that a mixture of sulphur (96 %), pyrethrum (2 %) and naphthalin (2 %) applied carefully with a sulphurer with a long tube, four to six times from early June to mid-August, prevents the attack of *Rhynchites ruber*. If this method, which deserves to be well studied, gives equally good general results, Apulia would save annually, according to the writer, several million francs.

MEANS OF PREVENTION AND CONTROL.

1241 POLE-EVANS, I. B. **A Fungus Disease of Bagworms in Natal.** — *Annales Mycologici*, Vol. X, No. 3, pp. 281-284, figs. 1-2. Berlin, Juni 1912.

Natal

Bagworms, or basket-worms (larvae of *Euneta* sp.), are rapidly increasing in Natal; they attack the plantations of *Acacia mollissima* (1) and have become a serious menace to the wattle industry. These insects are Lepidoptera belonging to the family *Psychidae*.

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(1) See *B.* Feb., 1911, No. 499; June 1911, No. 1794; Aug-Sept.-Oct. 1911, No. 2722. (*Ed.*).

Recently, Mr. T. M. MacKenzie observed, at Crammond, that all the bags which showed the white fungus contained dead worms, and he naturally surmised that the fungus was a parasite.

After having examined it, the writer found that the invader was a new species of *Isaria*, to which he gave the name of *I. Psychidae*. Numerous inoculation experiments have confirmed the parasitism of this *Isaria*, which the writer intends to try as a control of *Euneta*.

Bees protecting Sugar-Beets from the Attacks of Beetles. — See above, No. 1168. **1242** **Russia**

HEWITT, C. GORDON. **The Control of Insect Pests in Canada.** — *Department of Agriculture, Canada: Experimental Farms, Bulletin* No. 9, 13 pp. Ottawa, Canada, 1912. **1243**

The author gives an account of the war against insect pests in Canada and of the manner in which insect pests have infested the country as it has gradually been opened up and cultivated. The manner in which the Dominion and Provincial Governments are endeavoring, by legislation and other means, to prevent the introduction of insect pests and increase and spread of those pests already in the country is described. A summary of the various lines of work undertaken and carried on by the Division of Entomology at Ottawa is given relating to insects affecting farm crops, fruit-growing, forest and shade trees, insects attacking man's possessions and infesting houses, attacking domestic animals, and finally affecting the health of man. **Canada**

POLI, POLO. **The Control of Rice Field Pests.** (1) (Contro i nemici animali della risaia). — *Il Giornale di Risicoltura*, Anno II, No. 11, pp. 167-168. Vercelli, 15 giugno 1912. **1244**

Mild winters, when frost is rare, are very favourable to the development of many animal organisms, which live in the rice fields and do much harm. The best known are snails, *Apus cancriformis* and *Nepa cinerea*; to these must be added the larvae of many insects: these often invade the young crop after having hibernated in the stubble. The damage they cause is rarely the result of **Italy** their feeding, being usually due to their large number and to their moving about in the light upper surface of the soil, where the young rice plants are about to take root. These movements disturb the soil and loosen it, so that the roots of the plants are unable to fix themselves in the ground.

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(1) See *B.* Feb. 1912, No. 455; March 1912, No. 592. (*Ed.*).

Usually, the pests chiefly infest and injure old established rice fields, where the plants in any case take root with difficulty.

The most efficacious remedy is to completely drain the affected lots for two days. This measure not only destroys the unwelcome guests, but helps the growth of the rice, putting at its disposal a larger supply of nitrogen and facilitating both the respiration of the roots and the transformation of organic substances. Where, owing to the presence of these animals, the rice plants have perished or been much thinned out, young and if possible luxuriant plants must be transplanted; these, however, must not have tillered, or be too far developed.

A good measure against rice pests is to lime the soil on the approach of winter, an operation which is equally advantageous to the growth of the plants.

1245 SAVASTANO, L. **Pumps and Spraying for Lime-Sulphur Mixture.** (Irrorazioni e pompe per la poltiglia solfo-calcica) (1). — *R. Stazione sperimentale di Agrumicoltura e Frutticoltura in Acireale, Bollettino* No. 6, 8 pp., 6 figg. Acireale, maggio 1912.

Italy

According to the formula of the Station, a lime-sulphur spraying mixture was obtained concentrated to a density of 1.23 to 1.27 Baumé; it can consequently be used in 4 % strength without risk of burning the leaves and fruits during the vegetative period of the tree; in 6 % strength in summer for those species which rest during that period (citrus trees); in 8 % strength, though it is not advisable, for other plants, for instance the olive tree. In winter the mixture can be used in a strength of 8 %. It forms an insecticide and fungicide of brief duration of action, less than that of the copper-lime mixture; at first it acts with great intensity but this afterwards decreases. Winter spraying against certain scales, according to the experiments made hitherto, does not seem to have thoroughly achieved its purpose.

The Author has adapted and tried two kinds of pumps, one a foot pump and the other mounted on a single wheel truck and suitable for large and small orchards, easily transported, dismountable and solid; to work it one operator and one assistant are required.

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(1) See *B.* June 1912, No. 975. (*Ed.*).

For spraying 100 citrus trees the Author calculates the expense as follows:

Spraying operator, 2 days at 2*s*. 9*d*. . . .	5*s*. 6*d*.
Pump man, 2 days at 1*s*. 6*d*.	3*s*. 0*d*.
Assistant, 2 days at 1*s*. 6*d*.	3*s*. 0*d*.
Mixture of 5 % strength, 440 galls. at 1*s*. 1*d*. per 100 (reckoning the concentrated at 2 ½*d*. per gallon)	4*s*. 9*d*.
Sundry expenses and wear	9*d*.
Supplementary spraying reckoned in the aggregate	2*s*. 6*d*.
Total . . .	19*s*. 6*d*.

The Author finally recommends citrus growers to prepare the lime-sulphur mixture themselves in order to avoid heavier expenses.

INSECTS AND OTHER INVERTEBRATES INJURIOUS TO VARIOUS CROPS.

1246 Müller, C. and Molz, E. ***Bibio hortulanus* damaging Sugar-Beets.** (Über Schädigung von Zuckerrüben durch die Gartenhaarmücke, *Bibio hortulanus* L.). — *Deutsche landwirtschaftliche Presse*, XXXIX. Jahrg., Nr. 46, S. 537, Abb. 499. Berlin, 8. Juni 1912.

Prussia: Province of Saxony

This year almost the whole of the crops in many parts of the Province of Saxony have been invaded to an exceptional degree by *Bibio hortulanus* L.

The Authors on the 21st May last noted at Wolmirsleben that the larvae of this fly had made inroads on the beet to an extent not previously observed, anywhere in the Province of Saxony.

The insect lays its eggs chiefly in decomposing vegetable remains left in the fields, on farmyard manure etc. It is desirable consequently to remove such remains from the land, or bury them, and particularly to see that the manure is covered over.

To counteract the damage which the grubs may cause to the parts of the plant above soil, the use of a mixture with a basis of Schweinfurt green is advisable, as soon as the presence of these insects is reported.

By way of a preventive measure moreover it is expedient to disinfect the beet seeds.

1247 France NOEL, PAUL. **Pests of the Asparagus** (1). (Les ennemis de l'asperge) *Bulletin du Laboratoire régional d'Entomologie agricole*, Troisième Trimestre 1912 (juillet-août-septembre), pp. 9-10. Rouen, 1912.

The Author enumerates the following parasites:

Coleoptera: *Crioceris* (*Lema*) *asparagi* L., *C. campestris* Pr., *C. 5-punctata* Fb., *C. 12-punctata* L., *C. 14-punctata* Scop.

Hemiptera: *Aphis papaveris* Fb., *Aphrophora spumaria* L.

Lepidoptera: *Mamestra pisi* L., *M. oleracea* L., *M. chenopodii* F., *Calocampa exoleta* L.

Diptera: *Ortalis fulminans* Meig., *Psila* sp. and an undetermined Cecidomyid.

Fungi: *Puccinia Asparagi* DC., *Rhizoctonia violacea* Tul.

1248 France NOEL, PAUL. **Pests of Cress.** (Les ennemis du cresson [*Nasturtium-Sisymbrium*]). — *Bulletin du Laboratoire régional d'Entomologie agricole*, Troisième Trimestre 1912 (juillet-août-septembre) pp. 11-13. Rouen, 1912.

Premising that the most serious damage to which this crop is exposed is attributable to a small mollusc, *Limnea truncatula*, the Author enumerates the other pests of the cress. They are:

Coleoptera: *Ceutorrhynchus griseus* Brisout, *C. atomus* Bohem., *C. sulcicollis* Payk., *Poophagus nasturtii* Pk., *P. sisymbrii* F., *Haltica* (*Phyllotreta*) *nemorum* L., *H. excisa* Rdt., *H. vittata* Rdt., *H. rapa* Ill.; also an undetermined beetle.

Hemiptera: An aphis not yet determined.

Hymenoptera: *Aulax kerneri* Wach.

Lepidoptera: *Pieris rapae* L. and an undetermined caterpillar.

Diptera: *Cecidomyia sisymbrii* Schk., two undetermined Cecidomyids, *Contarinia ruderalis* Kieff., *C. nasturtii*, *Dasyneura sisymbrii* Schrank, one undetermined fly, *Perrisia stachydis* Brem., *Hydrellia ranunculi*.

Acari: *Eriophyes drabae* Nap. and three undetermined Eriophyids.

Fungi: *Cystopus candidus* Pers.

1249 NOEL, PAUL. **The Pests of Chrysanthemums.** (2). (Les ennemis des chrysanthèmes). — *Bulletin du Laboratoire régional d'Entomo-*

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(1) See *B*. Feb. 1911, No. 618; May 1911, No. 1587; July 1911, Nos. 2289 and 2362. (*Ed.*).

(2) See also *B*. Dec. 1910, p. 366; Feb. 1911, No. 698; July 1911, No. 2300; Jan. 1912, No. 224; Feb. 1912, No. 415. (*Ed*).

logie agricole, 3ᵉ trimestre 1912 (juillet-août-septembre), pp. 6-8. Rouen, 1912.

The following is a list of the enemies of chrysanthemums: France

Coleoptera: *Cleonus trisulcatus* Hbst., *Apion sahlbergii* Grh., *Ceutorrhynchus chrysanthemi* Germ., *Agapanthia cardui* F., *Phytaecia pustulata, Haltica chrysanthemi* E. H.

Hemiptera: *Capsus discolor* Fll., *Aphis papaveris* F., *A. sonchi* L., *Trioza chrysanthemi* Low., *Acanthosoma hemorrhoidalis, Lygus pratensis, Ptyelus spumarius.*

Lepidoptera: *Mamestra serena* S. V., *Cucullia tanaceti* S. V., *Triphaena* (*Agrotis*) *ianthina* S. V., *Sciaphila wahlbomiana* Hb., *Gelechia chrysanthemella* Hfn., *Bucculatrix nigricomella* Hb., Zll., *Coleophora chrysanthemi* Hfm., *Depressaria culcitella* H. S.

Diptera: *Trypeta leontodontis* De G., *T. stigma* Low., *T. stellata* Fssl., *T. gemmata* Mg., *T. proboscidea* Low., *T. artemisiae* Mg., *T. Zoe* Fb., *T. nigricauda, Phytomyza lateralis* Fll., *Ph. albiceps* Mg., *Lasioptera chrysanthemi* Low., *Rhopalomyia hypogoea* Low., *R. syngenesiae* Low., *Clinorrhyncha chrysanthemi* Low., *C. leucanthemi* Kieff., *Urophora stigma* Low., *Contarinia chrysanthemi* Kieff., *Tephritis proboscidea* Low.

Acarina: two undetermined Eriophyids.

Nematoda: *Heterodera radicicola* Greeff., *Aphelencus olesistus* Ritz.

Fungi: *Septoria Chrysanthemi* Cav.

1250

CARDONNE, P. ***Otiorhynchus allardi*, a Vine Parasite.** (Note sur un charançon parasite de la vigne). — *La Revue des Colons de l'Afrique du Nord*, No. 7, pp. 145-146, 1 fig. Alger, 16 mai 1912.

The Author describes this insect as a vine pest in Algeria. The females, towards the end of the summer, lay from 100 to 140 Algeria eggs near the base of the stem. The grubs, which soon emerge, begin their injuries by attacking the roots. Having passed through the winter in the chrysalis state, they complete their metamorphosis in the spring; the perfect insect appears at the end of May or the beginning of June, according as the spring is more or less hot. At nightfall the insect emerges from its hiding place, climbs up the stocks and devours those grapes already well developed, descending and hiding in the soil at sunrise; in the absence of grapes it feeds on the leaves.

The only practical means of control consists in gathering the perfect insects, making use for this purpose of funnels designed on the model of those employed for the Haltica of the vine, but of larger dimensions (27 to 37 in. in diameter). If these funnels are put beneath the plant at the break of day and the branches shaken afterwards, the insects drop, and are collected in a bag put under the funnel.

1251 LÜSTNER, G. ***Otiorrhynchus ligustici* injurious to Apple Grafts.** (Käferschaden an Apfelveredlungen).— *Geisenheimer Mitteilungen über Obst-und Gartenbau*, XXVII. Jahrg., Nr. 7, S. 104-106, Abb. 27. Geisenheim, Juli 1912.

Germany

During the last few years, the year-old grafted apple trees in the nursery of the " Königl. Lehranstalt für Wein-, Obst- und Gartenbau " at Geisenheim, have been much injured during their development by the attacks of *Otiorrhynchus ligustici* L. The insect devours the leaves, beginning at the margin and making its way to the central nerve; often no trace of the leaf remains.

This *Otiorrhynchus*, known throughout Europe, is of frequent occurrence in Germany, Austria, and France. In the two first countries, it especially attacks the vines; in France, it damages both vines and peach trees. The insect is also known to be injurious to lucerne, rose-trees, various Leguminosae, hops and Umbelliferae.

In order to prevent the spread of the pest, it is well to collect the adults and destroy them at once; these only go out at night in search of food; during the day, they collect at the foot of the plants, which shelter them, or beneath stones or clods of earth.

Rooks do a great deal in destroying these weevils.

1252 ALVAREZ, TEODORO. ***Hypermallus rusticus*, a Beetle injuring Apple, Plum and Quince.** (Un nuevo parásito : el taladro de los frutales). — *Revista de la Asociación Rural del Uruguay*, Año XLI, Num. 4, pp. 239-241, 2 figg. Montevideo, Abril de 1912.

Uruguay

Some years ago the Author had noted that, in the departments of Montevideo and Canelones, many apple, plum and quince trees had their principal branches and some parts of the trunk perforated and mined with galleries evidently excavated by insects. This observation was a new one in relation to Uruguay. The trees affected appeared to be ailing and some of them were approaching death. The investigations at once set on foot by the Author to identify this parasite accurately, produced negative results for the moment. Finally, in December 1910, when visiting the orchard of the " Campo de Ensayos de Toledo " then belonging to the " Division de Agricultura, " the Author observed various apple and plum trees with the same injuries as the above. Removing some branches from diseased apple trees, he found, inside the galleries they contained, grubs which, when properly reared, after about a year pupated inside fragments of apple branches which the Author had supplied to them from time to time. On the 15th December 1911 there emerged from one of these fragments a perfect insect which was identified as *Hypermallus rusticus* Leponte, a beetle of the family of the Cerambycidae or Longicorns.

The same insect was afterwards found again in the garden of the " Campo de Ensayos, " where it caused grave injury to specimens of *Blepharocalyx lanceolatus*, an ornamental member of the Myrtaceae.

The Author recommends frequent inspection of the orchards and destruction by fire of the parts attacked, to prevent the propagation of the parasite, which might otherwise end by becoming exceedingly injurious to the orchards.

ALFREDO RUGGERI, *gérant responsable.*

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